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"Activin"

Preparation of the Chemical—Chemical Characteristics—Action on Starch—Application

By ROBERT P. WALTON

RECENTLY[1] a material has been introduced into the textile industries termed "Activin" for which a number of attractive claims have been made and which has, at least, attracted considerable attention[2]. The substance is claimed to be a particularly effective starch "solubilizing" agent and thus should find extensive use in the "thinning" of starch pastes. For certain bleaching purposes it has also been recommended. Because the chemical nature of this substance is not a matter of general knowledge in the textile industries, a description of its most important characteristics are given here. This treatment is by no means intended as a recommendation of its superiority over the other materials used for the same purpose. Claims of any marked advantages have been sharply contested by some[3].

Although this material is of comparatively recent advent in the textile industries, the aniline chemist will recognize in its formula (sodium p-toluene sulphochlor amide) an acquaintance of somewhat longer standing, *Chloramine T*. Other terms by which it is known are Chloramine-Heyden, Chlorazene, Tochlorine, Tolamine, Pyrgos, Mianine, and Dakin's antiseptic (not to be confused with the hypochlorite). Zauberin, Mannolit, Gansil, Glekosa, Purus and Washington Bleach are trade names for detergents and bleaching agents containing Chloramine T as the active principal.

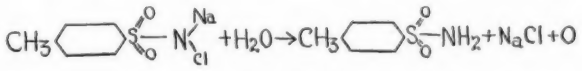
Preparation

The material is ordinarily obtained from p-toluene sulphonic chloride, a by-product of saccharine manufacture.[4] The Chemische Fabrik von Heyden A. G.[5] have patented a process for its preparation whereby p-toluene sulphonamide is treated with calcium hypochlorite and the resulting product converted into the sodium salt by double decomposition with NaCl.

Inglis has detailed its preparation directly from toluene.[6]

The material is neutral to phenolphthaline, gives off a weak odor of chlorine, is about 15 per cent soluble in water and crystallizes with 3 molecules of water of crystallization.

The decomposition in aqueous solution is according to the equation:



The neutral, inert materials p-toluene sulphochloramide and NaCl remain as reaction products; these substances do not cause precipitation or other complications when the starch is mixed with the usual pigments or softening agents. All the oxygen becomes effective, in contrast to the hypochlorites in which a portion of the active oxygen is rendered unavailable by the formation of a stable chlorate. With concentrated HCl an evolution of free Cl_2 is obtained. The oxidizing action, naturally, is accelerated by high temperatures. In the absence of oxygen receptive materials the process goes very slowly, so that the reagent may be preserved for considerable periods and even boiled without any marked loss in activity.[7]

Haller and Hohmann[8] have made a comparative determination of its oxidizing power by testing technical samples of Activin, perborate and bleaching powder by titration with permanganate. For the titration, 30 c.c. of a 1/10 N solution of the substance were mixed with 5 c.c. concentrated sulphuric acid, diluted with water, and 20 c.c. of Ferroammonium sulphate solution added (whose strength has been determined with permanganate). The non-oxidized salts are titrated back with permanganate.

Besides this determination, the equivalents were determined iodometrically. Here 20 c.c. of a 1/10 solution of the substance were mixed with an excess of KI and sulphuric acid and the separated iodine titrated with thiosulphate. According to both of these methods, the ratios of the activity of the three substances stand in the order: Activin; bleaching powder; sodium perborate: 1; 1½; 3.

The material is an extremely efficacious bactericide and was used extensively in the late war[4, 9]. The toxicity is very low, however, approximately 100 gr. being the fatal dose for a normal person.

The reagent exhibits maximum effectiveness in the

presence of soda or alkali, although with acids there is a mutual decomposition. A catalyst of some sort is usually necessary in order for it to exhibit its maximum activity, $CuSO_4$ apparently being the most effective.[8]

Action on Starch

When starch pastes are heated with a small amount of certain materials, generally classed as oxidizing agents, a decrease in viscosity is observed. This "thinning" action may be merely a physical matter of more complete colloidal dispersion, a lowering of molecular aggregation, a depolymerization of the starch molecule, the hydrolysis of some noncarbohydrate constituent, or the removal of some electroviscous effect[10]. Sufficient treatment with these agents reduces the viscosity of a thick starch paste to practically that of water. Sugar formation is relatively low with such agents even under drastic conditions; under the conditions for solubilization of starch, sugar formation is almost inappreciable.

A great number of such chemicals have found practical use in the textile industries, among which may be mentioned: persulphates[11], permanganates[12], perborates[13], hypochlorites[12, 14], ozone[15], sodium peroxide[16], hydrogen peroxide[16] and chlorine[17].

The decrease of viscosity or "solubilization" produced by oxidizing agents Chloramine-T included, is not accompanied by the formation of sugar and the resulting modified starch gives a pure blue iodine coloration[8]. From a number of standpoints this is advantageous in that the presence of the more hygroscopic sugar is usually objectionable, and also in that the formation of sugar usually indicates a more profound process of degradation with an accompanying loss of appreciable quantities of starch.

Haller and Hohmann[8] have made a large number of viscosity determinations following the action upon starch of Activin, other oxidizing agents and also various enzymes. Their methods of comparison, however, are open to serious objections, some of which were stated by Hesse[18]. For a rough approximation of activity, however, it may be accepted that 1 per cent of Activin by weight of starch (specifically potato starch) is sufficient to form a clear, fluid solution when heated with the starch paste.

Application

A procedure for preparing "thin-boiling" starch is as follows:

Suspend potato starch in 10 times its weight of water, add 1 per cent of Activin by weight of starch, introduce direct live steam. At 60 deg. Cent. a paste is formed which upon further cooking (5 to 15 minutes) again becomes liquid[19]. According to the quantity of Activin and duration of cooking, the viscosity varies from that of a thick syrup to that of a watery liquid. The starch prepared in this manner is neutral, glassy clear, uniform and possesses a high adhesive power. Almost the total quantity of the starch remains in an intact condition, that is, there is practically no degradation of starch to dextrins and sugars.

American users have found, in working with cornstarch that considerably larger amounts than 1 per cent are necessary to effect solubilization. It has been known for a long time that cornstarch is much more resistant to such action than potato starch[10] and because cornstarch is used so extensively in American textiles industries, it is doubtful whether this material (p-toluene sulphochloramide) will be generally adopted.

Activin has been recommended for the removal of starch from fabrics, particularly if moderately high temperatures are permissible. Fabrics apparently are not injured by the action of Activin, as has been shown in certain bleaching tests[20].

Wegener[21] has described the use of Activin for preparation of a cheap but effective color thickener, and Feibelmann[22] has described the use of Activin modified starches for curtains and for the printing of blue fabrics. Feibelmann also recommends Activin treated starch sizes for other types of textile fabrics such as cotton flannel, damask, etc.

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Proceedings of the American Association of Textile Chemists and Colorists

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SEVENTH ANNUAL MEETING

OPEN FORUM SESSION

December 2, 1927

The Open Forum Session of the Seventh Annual Meeting of the American Association of Textile Chemists and Colorists convened in the Pennsylvania Hotel, New York City, at 8.30 o'clock, Professor Louis A. Olney, president, presiding.

President Olney—The Open Forum was instituted at the Boston meeting two years ago, and it was so successful at that time that it was continued last year and we decided for that reason to put it on the program for this meeting in New York. The idea is to have the talking done from the floor. I am here simply to preside and see that the program is more or less continuous, but I am not here to answer questions. I shall take no active part in the discussion, except so far as the first subject is concerned. I have been asked to open the discussion on that subject.

. . . President Olney then spoke as follows on the topic, "What Constitutes an Adequate Education for a Textile Chemist and Colorist?":

What Constitutes an Adequate Education for a Textile Chemist and Colorist?

Discussion Opened by
Prof. L. A. Olney

We always have had, and probably always will have in our midst, the man who boasts that he is "self made" (whatever that may indicate), and who contends that much time spent in securing an education is not merely a waste of time but may even prove to be an encumbrance. He is perfectly honest in his belief, and any attempt to convince him that he might be even a little bit wrong would be futile.

It cannot be disputed that many men have been highly successful in connection with the textile industry who have had little if any education. Men who possessed natural ability, particularly along the mechanical line, together with a mind of the type that had a tendency to systematize and organize their thoughts and actions, even though they had but little academic or scientific education, became quite efficient mill men after a few years of experience in what they were pleased to characterize as the "School of Hard Knocks."

However, be this as it may, the extravagant losses, economic wastes and colossal blunders that have come about in industry through unconscious ignorance and

lack of education would, if they could be measured, prove to be appalling.

Furthermore, could we suddenly place the man who was highly successful under the conditions of fifty or sixty years ago, with its long hours, its wasteful handling of materials, and in many cases but little competition, into the present era of highly organized methods of cost finding, efficient management and keen competition, he would in most cases be likely to fall down completely; at least until he had secured sufficient education to fit him for his position.

In other words, fifty years ago there was so little known about scientific management and even the fundamentals of scientific manufacturing, that one could quite readily pick up all that was absolutely necessary as he came along. To-day, however, the situation is quite different. There are so many highly important things known, and so many that must be learned if one would secure a position of any importance, to say nothing of holding it, that the only way to get it and save time is via the road of a systematic education.

What we have said of the textile industry in general is even of greater applicability when we come to the specialized field of textile chemistry and dye application, and I doubt if even the most successful rule-of-thumb devotee, no matter how much he stresses the value of practical experience as compared with theoretical knowledge, but would admit that systematic education of the proper type presented the most effective, if not the quickest, way to gain entrance and make subsequent progress in this branch of the industry.

Defining "Textile Colorist"

During the early days of my educational experience I was so frequently asked the question, "What is the difference between a textile chemist and a textile colorist, and between a textile colorist and a dyer?" that I found it quite necessary to define each more or less clearly, at least in my own mind.

From my point of view, a *textile chemist* is one who is fundamentally a thorough chemist, but in addition has specialized upon the study of the properties and composition of the various textile fibers, and upon the chemicals (including dyes) which are used in their bleaching, dyeing, printing and finishing. He must also be well posted as to the chemical reactions which take place between such chemicals and dyes, and the textile materials which are commonly used in the textile industry. In general, he knows more or less about the dyeing of textile materials, but he would not be expected to have sufficient experience to go out and run the dyehouse.

The *dyer* is one who has had a broad experience in the application of dyes and is well skilled in manipulative technique, and in color matching. He may or may not have a knowledge of chemistry, but the more he learns about the nature of the materials he is handling, both chemicals and fibers, a more intelligent and progressive dyer he will become.

The *textile colorist*, as I see it, is one with a broader knowledge and more general experience than either the textile chemist or the dyer. Like the textile chemist he is fundamentally a well-trained chemist, and has made a thorough study of the dyes from the point of view of both their composition and properties, and has had sufficient experience with their use to be able to direct large-scale processes of their application, and can, if necessary, take immediate charge of the operation. He might not have the manipulative skill of the textile chemist if routine analytical work was involved, but he would ordinarily know more about the composition, properties and application of the dyes, and be better able to visualize the chemical, as well as physical, mechanism of the combined processes of bleaching, dyeing, printing and finishing

The term *color chemist* is applicable to one who has specialized upon the structure of dyes and the chemistry involved in their manufacture. He usually has little if any knowledge as to their practical application, and no direct connection with the textile industry and need not be considered in our discussion.

The Fundamentals

With these preliminary remarks in mind we may be better able to answer the question: "What Constitutes an Adequate Education for the Textile Chemist and Colorist." The first requirement of all is a thorough course in chemistry, and if this can be combined with an intensive study of the chemistry of the fibers and the dyes, together with dyestuff application, much more may be accomplished in a given period of time. This, I believe, is the advantage which one derives by taking a course at a textile school of recognized standing. Furthermore, the textile background or setting which such an institution presents is entirely missing in the regular chemistry course at an ordinary college or university. I believe this to be of inestimable value, since the constant observation of textile machinery in operation and the association with men upon the instructing staff who are experts in different branches of textile manufacture, to say nothing of the contacts and conversations with a host of young men all aspiring to become the future leaders in the industry, are bound to give an emphasis and real meaning to the student's daily work that could never be hoped for in the college or university.

If we consider the textile industry from all angles, probably no industry involves the application of a greater number of chemical principles and a greater variety of

chemical compounds. In the first place, there are the raw materials of the industry, namely, the fibers, all of which are extremely complicated colloidal organic compounds, and in chemical reaction with these we have all of the compounds used in bleaching, scouring, mordanting, dyeing and finishing. As a result there are involved some of the most complicated reactions of chemistry, in fact, so complicated that many of them are not as yet fully understood. The composition, properties and reactions of the numerous coal tar dyes are also involved, and among these we find some of the most complicated of organic compounds. In addition to these considerations, which are primarily of a textile nature, the textile chemist must be thoroughly acquainted with water for industrial purposes, fuels, oils, and all of the problems of combustion and lubrication which are constantly arising in almost any industrial plant.

The Curriculum

As a result the textile chemist must have as thorough and complete a training in general chemistry as would be required of an industrial chemist or chemical engineer in any other branch. Furthermore, such a fundamental training must not only involve inorganic chemistry, but organic and physical chemistry, as well as the application of these subjects to analytical chemistry. It is needless to say that a thorough training in mathematics and physics is absolutely essential as a foundation for such a course.

The course which I have had the pleasure of directing for thirty years has been planned with all this in mind. The qualifications for admission are the generally recognized standard college requirements, and the course extends through four years and leads to the Bachelor's Degree.

The curriculum may be divided into three groups of studies, approximately equal, as far as time occupied is concerned, and running more or less simultaneously throughout the four years:

First—A combination of chemical subjects which taken as a whole provide a comprehensive course in chemistry, in the broader sense.

Second—The specialized study of textile and color chemistry, including dye application, dye testing and color matching. This group also includes the study of textile finishing and the principles of textile design.

Third—The more fundamental sciences and cultural subjects, including mathematics, physics, German, English, industrial history and economics.

As I have already stated, it is highly desirable that the student should spend at least two summers during such a course in the works, preferably in the dyehouse, and he should be encouraged to visit as many textile plants as time and opportunity will permit.

With such an educational foundation, followed by several years of practical experience after graduation, we believe that the best and most successful type of textile chemist and colorist will surely develop.

If one wishes to become merely a rule-of-thumb dyer, there is no question but what he should go immediately into the dyehouse, for in this way he will make more rapid progress in attaining his desire. He will find, however, in most cases, that within seven or eight years the student who entered upon his four-year course at the same time as he entered the dyehouse, will be much further along upon the ladder which leads to success, and with a future ahead that presents far greater opportunities for advancement.

Of course, much depends upon the natural ability of the man, and this is more of a factor than is generally supposed; but given a student of average ability or better, who is keenly interested in his work, and willing to continue his studies, in order to keep up with new development, and I can predict with 90 per cent accuracy the degree of success he will have attained within five or ten years after graduation. A study of our classified list of about 180 living graduates of the Chemistry and Dyeing Department of the Lowell Textile School will unquestionably justify this statement.

I might go into details regarding this subject indefinitely, but what I have already said is, I believe, sufficient to open the discussion.

Dr. Rose on Education for the Textile Chemist

President Olney—Dr. Rose has also been asked to say something in introducing this subject, and before opening the meeting to general discussion, I will call on him.

Dr. Rose!

Dr. R. E. Rose—Mr. Chairman and Gentlemen: I had one comforting thing to think of when I realized that I was to appear on the program to-night (which I am very glad to do) and that was that Professor Olney, speaking out of the thirty years of his wisdom, could cover the field so well that there would be very little for me to add.

I have had some experience in teaching, fortunately, and perhaps from my point of view I might emphasize some of those things which Professor Olney has put so clearly to us.

All of you who are interested in education, who want to think about it, ought to read Herbert Spencer's' "Essay on Education." Without going into detail regarding the classification given by Spencer, we may for our purpose classify the educational process as consisting of knowledge necessary for self-preservation, that necessary to maintain the individual in the community (that is, occupational education), and, finally, that part of education which renders the individual a pleasanter companion and makes his own life pleasanter to him, the esthetic development of the individual.

It is the occupational part of education, really, that the textile school has to look after, and the more experience I gain of life and of people who are working under modern conditions, the more I see that the danger is in trying to fit a man for a specific purpose rather than fit him to meet emergencies in all directions. That can be taken care of in this case pretty well, because those things which are fundamental to the textile chemist and colorist are also broad enough to make him capable of adapting himself to whatever may come up.

I think I should put physics ahead of chemistry as the fundamental science of all, but, of course, we are assuming Professor Olney to mean this: that the physics is out of the way, to some extent, and that some more is added to it afterwards. But I am somewhat doubtful, when it comes to chemistry, about the necessity for emphasizing it so very much even for a textile chemist. You must either go a very long way and become a profound chemist, or else you have to be content with a rather superficial knowledge of the subject, and I feel that in the great majority of cases, in textile work, the man who has a superficial knowledge of chemistry but a more profound knowledge of a broad range of subjects, is a little better off. I may be wrong.

With the outline that Professor Olney has given us there is no question but that we have covered the field adequately, but there is one subject I should like to bring up here. I want to know how, eventually, we are going to get a group of people who are not part of an organization in the sense that most chemists and colorists are in textile plants, but who are really creative thinkers in the problems of textile chemistry and its application in connection with textile work. I think we need some route by which we can take a good thinker, give him a broad, fundamental training, and then give him, superimposed upon that, an adequate, specific knowledge of the problems of textile chemistry, textile engineering, or whatever you like, so that he can devote himself to the very highest type of research.

Without any criticism, except in the most constructive way, I feel that we haven't reached that point in this country. It may be because there is not demand enough for men of this type. It may be that so few men of this type have been prepared that we haven't had the chance to build up the necessary machinery. After all, our institutions of learning are comparatively young, and they have been blessed (or cursed) with that blessing (or curse) of the whole nation: such a very rapid growth that you have all you can do to keep up with the growth, and you are glad when you go to bed at night to feel that you have turned out the day's work.

But I do think we ought to devote a little attention to that, and I should like to leave with you the thought that we need men of that kind and that everything this Association can do in forwarding the development of such men is of primary importance to the textile industry of this country.

I don't think that I have anything further to say. Thank you. (Applause.)

Discussion on Education for the Textile Chemist

President Olney—I should like to emphasize one of the points that Dr. Rose mentioned, namely, the value of a fundamental training for men who are to become the real thinkers in the textile coloring industry. If I could have my way, I should require every man who enters the Lowell Textile School to have a college training before he comes; in other words, to be a well-trained thinker. He would then have three years more, which would make seven in all.

If you could have entered into some of the arguments and discussions that I have had with men who come to the school with the idea of getting the whole thing in about one year, you would see why we are quite glad to compromise on a four-year course. That is not ideal, in the strict sense of the word. I think it should take just as much time and education to make the type of textile chemist and colorist that Dr. Rose has in mind as it does to make a surgeon, and that is at least seven years! He must have a college education before he starts, or virtually that. Then he has to spend four years in the medical school. He has to spend several years oftentimes in a hospital and in specialized study, and if he can make a satisfactory living from his practice in ten years, he considers that he is doing very well.

Some of the students who have in mind going into the textile coloring industry think it is something that they can almost get overnight. They see men going into dyehouses right from grammar school and becoming successful dyers, and there is no question that some of them are successful dyers, but they do not have the ability to think out many of the problems that come up in the daily work; these have to be referred to someone else who has had a training of the type of which I speak.

That is one reason why in my talk I distinguished between the dyer, and the textile chemist and colorist, because there is a distinction, at least, from my viewpoint.

I am taking up too much time myself. We should like to hear from anyone who has any thoughts upon this subject. We hope you will all take part in the discussion freely and without any urging. We have heard from two educators. Now can't we hear from the straight, practical side of the industry? I did not wish to draft anyone, but if no one will volunteer, I shall have to resort to that.

We will be very glad to hear from Mr. Wood.

P. J. Wood—You said you wanted to hear from the

practical side. I am also an ex-educator. (Laughter.) I spent two years lecturing at the University of Leeds a good many years ago.

I can heartily endorse the remarks of Prof. Olney and Dr. Rose. From my experience with the men who have come under my observation at the works, I have come to the conclusion that the main thing that is lacking in their education is that they haven't been made to understand the meaning of the German word "grundlich," which means "thorough." Anyone who has had any experience with German education will agree that is one of the fundamentals: thoroughness. Here I find there is a tendency to disregard thoroughness, and I think it is because of our American habit of trying to rush things to a conclusion. We regard the time element rather too seriously, I think, and I believe that is what Dr. Rose wants to get away from when he says he wants to find these men who will do serious thinking—and serious thinking can't always be done very quickly. If it is done quickly, it isn't done thoroughly. I think that is the great problem to-day: to get hold of men who can really think.

Apart from the stimulation of accumulation of actual facts in education, I think we should rather strive to accumulate habits, correct habits of conduct, and correct habits of thought. I think those will be found very much more valuable than a very large accumulation of facts.

I don't think I have anything else to add. (Applause.)

President Olney—Are there any further remarks upon this subject? If not, we will pass on to the next subject, because we have a fairly long program. "Rayon Processing," by Robert P. Morningstar, is going to open discussion.

Rayon Processing

By Robert P. Morningstar

Mr. Chairman and Gentlemen: I am not very much of a speaker, although I have to speak every day in the week, because I am selling most of the time, and that is the only chance I have to meet some of my friends whom I see here. I see Mr. Tenney out front, Mr. Sturtevant, and a few others.

I don't know why you called on me to speak because, frankly, I am the only one present who isn't a chemist, and after listening to Professor Olney's talk I appreciate that I should have gone to school longer, but my school has been the school of practical experience, and I think that is the hardest school of all. I have spent now (probably you will say I have spent it foolishly) sixteen years in contact with the textile trade. I don't know how many errors I have made. I don't know how often I have really gained my experience at the expense of others, but I am going to tell you something about my experience in the mills.

Years ago I started as a slasher hand in the Lincoln Mills, up in Fall River, Mass. I didn't have to do it but I wanted to do something during my college vacation. I got kicks during that time, and plenty of experience.

I found, after learning something about slashing, in later years, when it came to the subject of rayon, everyone was more or less confused on the matter of handling of rayon and handling of cotton. They thought that just because they could weave cotton, they could weave rayon.

As I said before, I am the only man in this audience who is not a chemist, and therefore I shall have to give you my practical views as nearly as I can, allied to the theory that I have drawn forth in my laboratory work.

To know a subject means to know it from every angle, and this requires thought, experiment and study. In my first study of rayon, I found that practically everyone confused the slashing of cotton or any other fiber with the sizing of rayon, to such an extent that rayon sizing machines, pressure on the rolls, tension, drying pressure, and every weaving unit were applied to processing rayon. Whereas the principle in slashing cotton is to inject moisture into the size, which is well intermingled around the burrs of the fiber and, lacking moisture, to humidify the weave shed in which the goods are woven, the principle of rayon is to gain instant penetration, quick drying film formation, leaving the filaments as straight and true as possible, and to weave without moisture in the air. But in either case, this film must remain flexible and permanency of flexibility means that moisture is present somewhere. This moisture must lie within the film whose outer coating must be dry to all appearances, but actually is not so, because in order to meet normal conditions where artificial humidity is resorted to, a non-drying lubricant not subject to oxidation is necessary.

The size itself is so important that it has become a general topic of discussion everywhere. The test of a rayon size is not easy to meet, because it means that in making the proposed film the solution must be capable of remaining in suspension a long time. When the solution is prepared and allowed to stand, if it precipitates on cooling, its value as a rayon size depreciates in proportion to the rapidity of precipitation. In other words, although the ideal temperature of sizing is about 120 to 125 deg. Fahr., very few mills size at these temperatures, allowing the size to become cold in a box, which means that, as separation takes place, the size is being absorbed and laid on unevenly to the extent that parts of the thread are covered with the film, while others have nothing more than a water coating, or have only absorbed water. Besides the above, which must be as nearly neutral as it is possible to obtain (because of its association with a lubricant, which must emulsify with and remain equally suspended with it) this size must be made.

As you well know (and there are probably present here manufacturers of all kinds of lubricants) it is difficult

to make a stable oil emulsion which remains stable any length of time in combination with other products. Having sold lubricants, you have met with all kinds of complaints, no matter how efficiently they worked out in the laboratory. In order to make a living, one must sell as much as possible, but selling a lot to-day and nothing tomorrow is not good business. This man's oil may be the finest in the world, for a given purpose, but that is no reason for trying it out on rayon. I think most of the mill men will agree with me on that. Where we have heretofore confused cotton slashing or weaving, or any of the other departments with that of rayon, we have also confused lubrication, and this is the point that I wish to bring out: It is the same reason that people have been so skeptical about the method of properly handling rayon; namely, when sizing rayon, when almost everyone tries to lubricate the yarn at the same time, I lubricate the size only.

I have had recent discussions on that score with many mill men, and they all claim there is enough sleaziness in rayon without adding more to it through lubrication. So instead of lubricating the yarn to weave it, we simply lubricate the size.

I am not going to take up here the discussion of skein sizing, because it is almost endless, but I should like to go on to a process that concerns all of us, and I think it will make fairly good discussion. I hope this is not too stiff a quiz course, either.

Strength of size for warps has been governed by the greatest number of ends on a beam. If there are 5 to 10,000 ends or more, the usual practice has been to size heavily. I can't agree with this principle. If the size film is flexible enough, resilient and pliable, it ought to be strong enough in dilute form to withstand all kinds of friction, chafing, and other tension. As an example, where most sizes are used heavily, in the same or finer constructions, I generally employ about one-third as much of my product, and results are the things that count. There is no balling in the wires, no dusting, exceptionally low breakage. If the warp is sized heavily, especially on some of the rayon taffetas that I have seen, the delicate silk thread has little chance of breaking through the heavy size film, and in popular constructions now on the market it is seldom that one finds perfect weaving where warps are heavily sized. The warp actually displaces the filling, causing a wavy effect in the fill and leaving a bare, reedy appearance. Many finishing plants have been blamed for faulty handling, when it actually happened on the loom. Of course, setting of the loom has great influence on any kind of weaving. Perfect alignment is necessary, but the fault of heavy sizing is the most frequent.

If one sizes warps, why not size filling also?

We have heard so much about shiners that we have rounded out the phrase, "A shiner is an elongation of the combined filaments of the thread of which a part of the twist has been removed."

Lubrication of yarn yields slip, and that is about all. Most of us have formed the opinion that to prevent shiners all yarn should be thoroughly lubricated. We forget, however, that rayon lubricated, only, will slough off the cop or bobbin and we can't get around it by winding tighter, because then it won't slip off well enough. If it has a slight retarding agency present, it will not slough off too rapidly. Every mill has endeavored to overcome this fault by any number of contrivances, tension, etc., and I have heard not infrequently blame cast upon manufacturers of looms, winders, shuttles, cops, bobbins, and even supply houses.

The slight retarding agency to which I refer is a size. Suppose we protect the filling yarn also with a flexible film so that contact with the warp will not cause brushing up of the fibers or tendering by pulling against its filaments. Let us make a very delicate film much lighter than that of the warp. It will not detract from even winding or copping, because the size is applied so delicately that the filaments are sized but left separate and unbound. They will lie straighter, retaining their softness, but will be far stronger.

I wish to quote one of the best-known weavers of rayon, from an article recently published in one of the trade journals:

"It is entirely reasonable to suppose that a thread with extra turns per inch will present less broken filaments from chafing or excessive manipulation than one which has less turns, other conditions being equal."

This coincides so nearly with what we've been doing that this next thought must appeal to you: If the yarn is sized first, won't it twist that much more, because of its reinforcement? We are twisting skein sized yarn with the result that we get a much higher twist without incurring any of the normal risks.

We are also winding directly from swift to cop or bobbin with a minimum of stops, and this precludes another operation.

Still another method now under experiment is proving interesting in the extreme. However, I am not at liberty to give out its details at this time. It may interest you to know that, although the filling size operations which I have described are vitally important, the percentage of size is so small that a barrel of my product, as an example, will last a big mill about a year or more and is, therefore, not a very desirable business proposition, except that it has given me a great deal more insight into converting and being able to assist those using rayon. Our average size is gauged at less than one-half of 1 per cent and in many instances far less than that.

You will probably say that it can't be done, but this

is what we are doing every day in the week. We are actually immersing a skein in the size solution in such dilute form that when the skein comes out the filaments are separately sized. You can tell that under the microscope, by the penetration that has been made. But they are not bound together, and they are just as soft, especially after winding, as when the yarn comes from the manufacturer, and they are in far better condition, because in skein sizing, instead of using an oil that will oxidize as the rayon manufacturer is apt to do, we usually wash the skeins out in a 3 per cent solution of soda ash, and then go on with the skein sizing operation. As I said before, I am not going to discuss skein sizing, because you have probably all been through it, and possibly hate it.

There is only one point with regard to skein sizing that would interest a dyer. Employing the same principles of skein sizing, the neutrality of my product enables the skein dyer to use it in the dye bath, except that it is added, separately prepared, when the bath has been fixed for its final shade. The usual dyeing assistants and oils are employed, and these are based on one-fourth to one-half the weight of the size, depending upon whether the yarn is for filling or warp. It can thus be combined with vats as well as direct colors. If a rinsing operation follows dyeing, then it is used as a last rinse.

I have said more about skein sizing perhaps than the popularity of machine sizing warrants, but I have done so in order to bring out the salient points of what one can do, which has not been generally practised before. You all know the various types of machines on the market. Confusion of ideas respecting the strength of rayon (or maybe it was because rayon had to be slashed or sized somehow) is the answer to the types most in use. We have worked hard to make a new machine applicable to rayon in every sense. Tension has never been properly understood. Too much pressure is exerted on squeeze rolls, which is practically unnecessary, for you know that rayon is the greediest of all fibers for absorption. Drying pressure on cans is so fiercely exaggerated that one wonders sometimes how they weave the yarn at all. And these are not half of the faults of sizing machines in the mills. Speed at all costs seems a mania with some, so that they dry the warps so bone-dry and let them come off so hot that one can't touch one's hands to them. That is why, when we see a machine built for sizing rayon, we become enthusiastic. I don't know how many ideas are swiped from one machine manufacturer by another. All I care about is seeing something done logically, showing a knowledge of what the ulterior must be, and that is why we have a chance to-day to express enthusiasm over the latest model.

It is a three-cylinder machine that is made over in Paterson by Van Vlaanderen. I am not boosting Van Vlaanderen just because I happen to know the concern, but because I think they have something marvelous in their sizing machine. They have thought out practically everything that heretofore has been the direct cause of weaving troubles.

This machine has a tension unit so perfect that when the beam is lifted on it is centered, adjusted to the desired width, straightened to prevent slip, and then locked into position. It has a non-slipping tension control which is practically unbreakable, with a choice of four points of adjustment, as well as the usual weights on the levers.

The size box is doubly jacketed by means of a closed steam coil running through the water of its jacket. It is wide and shallow and easy to clean. It has placement for a thermometer, also for a continuous feed supply line. In other words, the size is being indirectly heated.

The quetch is so placed that the yarn may run through the nip as usual, or up, over and down an additional idling roll, and between the pick-up and rubber roll, without any squeeze pressure. You know that you can force size into a soft twist cotton yarn without squeeze roll pressure through a triple immersion roll and get as good penetration as you can with 1,200 pounds of pressure on the squeeze rolls. Well, that's the principle of the additional idling roll.

Instead of having to wrap the first drying can so that the sized thread does not come into too sharply contrasting degrees with the first can, there is an individual controlling valve for each cylinder, because the greatest tension in sizing rayon, we have found, is when the rayon warp leaves the quetch and hits the first can. If you bring in closely contrasting degrees of temperature between the quetch and your first can, you are going to form elongation right at that point. At least, that has been our experience.

So this machine is arranged with the three cylinders and separate control on each cylinder. Number 1 cylinder may be lukewarm; number 2 should be the hottest; number 3 must be cooler than number 2. Then the warp will come off the last cylinder dry enough, not baked, because rayon shrinks away from the beam after cooling and you may account thus for many slack ends on the loom.

Under the last cylinder is placement for a shaft fan operated from a small motor, so that it insures a cool hand to the warp before it reaches the last beam for the wind. This has not yet been included, but is added if desired. It allows for a standard speed of about 9 yards per minute. I know many mills which size at about two to three times that speed, while there are others making beautiful material whose warps are

sized at about 6 yards per minute, or two-thirds of this speed.

On speeds there may be quite a bit of discussion. Some people are doing successful work at between 17 and 20 yards a minute on sizing, claiming that they don't allow for enough penetration—that is to say, enough absorption of the size by the rayon to make it necessary to dry at a very high temperature—and therefore they can dry at around 5 or 6 pounds pressure, so that when it comes off the cans it is dry enough to wind.

There is absolutely no chance for vibration in starting or stopping through its friction clutch. It is also equipped with a patented driving head, beam release and safety locking device, taking up all strain through its springs and preventing the usual pull when running.

The machine itself thinks for the operator; but there is one thing that the operator must do for himself, and that is to practise cleanliness. One of the most pleasing experiences I have had was at a mill where I was to have run a test. Before going there I had written telling them that the last test I had run in slashing was pretty difficult, because all the pails they used in the mill were either old dyehouse pails or had some muck from the slasher room in them, and I asked whether they wouldn't order some clean pails in advance. When I got there I found that they had ordered a dozen white enameled pails, but I also found that in that mill there was really no chance for criticism, because cleanliness is their by-word—and that ought to be given more consideration in the average slasher room.

That is all I have to say. (Applause.)

President Olney—The next subject is so closely allied to the one that Mr. Morningstar has presented that I think we will discuss the two together. The next subject is, "What Are the Present Difficulties Encountered in Processing Rayon?"

Now we will proceed to the discussion of the whole subject of rayon processing. Mr. Morningstar stated that he was not a chemist. He surely must be a physicist. He seems to have gone into the physics of rayon processing very thoroughly.

No one has been assigned to discuss the third topic, but surely someone has some thoughts on this subject that will be of value to others present.

Dr. E. H. Killheffer—Mr. Chairman, no one has agreed to open the discussion on that subject, but there were several requests for that sort of information. One of the gentlemen who asked me to put that on the program said that from where he sat there were plenty of objections.

President Olney—By the way, Dr. Killheffer, won't you come up to the platform? You were to help me, you know, on this Forum.

Surely someone has remarks to make on this subject or questions to ask Mr. Morningstar. If not, we will have to pass on to the next subject.

The fourth subject is, "Vat Color Dyeing," the discussion on this to be opened by Mr. Charles Williams. Is Mr. Williams present?

Dr. Killheffer—Mr. Williams sent word at the last minute that he couldn't be here.

Discussion on Vat Color Dyeing

President Olney—This is certainly a subject that many here can talk about. There is no doubt about that. Vat color dyeing covers a pretty broad field. If everyone here told what they knew about it, we would still be going at the next annual meeting, I think. (Laughter.)

P. H. Stott—At the last Annual Meeting, I had the privilege of reading a paper on the development of vat dyestuffs in America, speaking purely, of course, from the manufacturing standpoint, and the compilation of statistics, to indicate the growing importance of vat colors in textile application. At that time, I made the suggestion that research might be carried on in some of the textile mills of the country relative to the vat dyeing of silk, skein and piece. I wonder if there has been any progress in that direction since last year.

President Olney—There is a question. Can anyone answer it? What do you know about that, Dr. Rose? You come in contact with the various mills that are applying vat dyes. Has there been any great progress in research along that line in the past year?

Dr. R. E. Rose—Of course, I am only a little pot dyer. I am not the man to tell you about vats in mill practice, but the principal advance that I think has been made has been in the printing rather than dyeing with vat colors.

I can't think of anything to say with regard to the dyeing of vat colors.

President Olney—I see a number of men here who could tell us something about the printing of vat dyes, if they would. (Laughter.) I don't wish to embarrass anyone by asking him to tell us something that he would prefer keeping to himself, but if there are any present who can tell us some of the advances that have been made in the printing of vat dyes in the last year, we should be more than pleased to hear from them. We don't want any secrets disclosed, but we think probably there are enough facts that could be disclosed here that are not secrets that would be interesting to many of us.

Vat Dyes in Printing

A. R. Thompson, Jr.—I am not going to say anything about the application of vat dyes in printing, but I am going to tell about a principle that is used in the applica-

tion of vat dyes in printing that is applied in the use of those same colors in dyeing either raw cotton, yarn, or piece goods.

It is commonly known that sulphoxalate compounds are used in the printing of vat colors to reduce them, due to the fact that a hydrosulphite compound would not stand the high temperature required in steaming to reduce and make the color soluble.

In the dyeing of certain vat colors, a high temperature is required to get penetration, and to get the best dyeing and exhaustion. At those high dyeing temperatures the amount of hydrosulphite required is often so great that it requires much more than other dyes in other classes require for the same percentages.

We have worked out a way of combining the principles of vat printing with vat dyeing, and combining the sulphoxalate and the hydrosulphite compounds on that class of dyes that require the high temperature, and the reduction holds up perfectly to the end of the dyeing; it seems as though a better exhaustion is obtained; better penetration is obtained; and it doesn't cost any more, because we do not add this other compound in addition to the hydrosulphite, but it replaces about 40 per cent of the hydrosulphite that would ordinarily be used in the correct formula for dyeing that particular color.

This new idea is not particularly adapted for the colors that go on at below 120, but the colors that are applied at from 140 to 180, or at the boil, are well applied in that manner. (Applause.)

President Olney—Are there any further remarks?

P. H. Stott—A recent patent taken out by some British concern deals with the use of stearic acid soap and soda ash in the reduction of vat colors, and claims are made for that patent that reduced vats can be obtained with a smaller degree of alkalinity and at the same time not a great loss of color value. I have done a little research work on that problem, although I can't say there is any report to be made, except that the patent seems to be justified.

I wonder if any other men here have thought about that patent, or modifications of it, with the idea of using such a method for the dyeing of animal fibers?

President Olney—You have heard the question. Can anyone answer it?

C. P. Harris—I should like to ask the gentleman whether he has tried it on various classes of vat colors, or only on certain types, and what results he has obtained.

P. H. Stott—As far as I am able to say, it works better on the thioindigo colors than on anthraquinone colors.

O. W. Clark—I should like to ask why there is so much secrecy regarding vat colors. I have only been working on them a short time, but so far I haven't discovered the great secrets. The only secret that I can see in connection with them is giving great attention to detail. (Laughter.)

President Olney—Will anyone reply to that? (Laughter.) I think this subject is worthy of more discussion than we have had so far. Where are some of these men with the secrets, if there are any, which seems to be questioned? I think you must be right, Mr. Clark. There doesn't seem to be any secrets. (Laughter.)

We are going to digress from the printed program for a few minutes.

This afternoon, at our Research Committee meeting, Mr. Ripley, the chief chemist for the American Woolen Company, was to present a report of progress in regard to some work which originated in the Research Committee* a year or more ago. Dr. Chapin presented a paper at that time upon the relative action of sodium and potassium compounds on wool. That paper, of course, was written from a more or less theoretical point of view, and we thought it would be very valuable if the conditions discussed in that paper could be worked out on a practical scale, and we have made some progress in having practical work carried out along that line.

I think Mr. Ripley is here, and we should be pleased to hear from him at this time. (Applause.)

P. F. Ripley—The subject was taken up at one of our mills only quite recently, and I don't think it is really in shape to bring before a meeting of this sort. It might have been brought up in the meeting of the Research Committee, but we have not gone far enough so that any data could be presented at this time in definite enough form.

I can simply say that we have put a lot of wool through the scouring; in one case part of it scoured with a soda soap and the other part scoured with a potash soap, the soaps being so made up that the proportion of caustic to fat was the same in both cases, and so made up also that the viscosity of the soap solution made up in equivalent concentrations was the same. In order to do that, the grade of the fatty matter had to be altered in the two cases, of course.

The work has not gotten far enough along so that any report as to the possible difference in the condition of the wool, after scouring, can be definitely decided on, and it is to be carried on further, and probably one or two more lots will be put through under similar conditions.

President Olney—Thank you.

*Research contribution No. 4; February 7, 1927, issue of Proceedings, Am. Assn. Tex. Chem. and Col.; American Dyestuff Reporter, page 90.

Mill and University in Research

The next subject is somewhat along the line of our first discussion, "Co-operation of Mill and University in Research." It is a combination of education and application of textile chemistry and coloring at the same time, you might say.

I think there is great opportunity for co-operation between the educational institutions of this country and the mills. I think abroad there has been more co-operation between them than there has ever been in this country, although I think the last few years have witnessed developments along that line, not so much in the textile industry as in other industries.

May we hear from someone on this subject?

Alan A. Claflin—This subject, as Dr. Olney has said, does involve the first subject, and it also brings forward very strongly the point that Dr. Rose raised.

I know at M. I. T. one of the questions that have been raised is, How are they to offer their facilities and resources to the textile industry when the textile industry doesn't want their assistance? My own opinion, from more or less contact with both M. I. T. and the textile interests, is that the reason there is so little co-operation between the two is that they speak different languages. They don't understand each other. There is a lack of men who are familiar with both the language of the university and the language of the textile mill. I know when I see the wonderful equipment of the Lowell Textile School I can't help feeling it is too bad that they can't have fellowships there for graduates of universities, or even more advanced students than graduates of universities, to study some of the problems involved.

With regard to the point Mr. Stott brought up, about a recent English patent for using stearic acid combined with soda ash in dyeing vat colors, every university has an equipment for determining the potential of various solutions of the pH. They all have pH "museums," as we call them locally, and there is something that needs to be done to determine the pH which is required to keep the various vat colors in solution. That is something that could be determined in fifteen minutes for each individual dye in any university laboratory, and yet the statement isn't made. If the pH were known there wouldn't be any opportunity for putting in a simple buffering substance like stearic acid, and perhaps penalizing the textile industry for seventeen years, because somebody has thought of applying that little elementary patent of using a buffer solution.

If they would just realize that there are twenty or perhaps thirty points which should be investigated and standardized, then the whole subject would be elucidated and you could get further co-operation; but the trouble is that there has been a lack of people who were familiar with the language of the university and who also appreciated the problems of the textile interests. It seems to me that difficulty can be best overcome by some doctors taking a post-graduate course at the institute, and I should think that fellowships might be available for that purpose.

President Olney—Are there any further remarks on this subject? Have you anything to say, Dr. Rose, on that subject?

Dr. R. E. Rose—No, I think not.

President Olney—Personally, I believe that the textile industry does quite a little research work itself in its own laboratories where men are employed who are thinkers, and capable of doing such work. It is being done there to accomplish some specific purpose, as a rule, and not for the purpose of fundamental research work that would be of value to everyone, and in regard to which there should be no secrets. I think there is great opportunity for fundamental research work in this country along textile lines, and I think the Research Committee of this Association has in mind doing as much as they can eventually along the lines of fundamental research work in textile coloring lines, and dyestuff application. I think that has been much neglected in this country

Is there any further discussion of this particular subject?

We will pass on to the next subject:

Ways and Means of Bringing Textile Manufacturers to a Fuller Appreciation of the Value of Technically Trained Personnel in Processing Departments

I don't know who suggested that subject, but I should suggest if he is here he might open the discussion. . . . He doesn't seem to be here. (Laughter.)

That is a rather broad subject. Perhaps someone can tell me just what is included in the strict sense of "processing departments" as applied to all of the different textile fibers, including cotton, wool, silk and rayon. We use the term "finishing" in some places. Since rayon has come in, this term "processing" has been used much more than formerly. If you take it in the broad sense, "processing" can mean anything that is done in the plant, I should say. In the strict sense, though, it is limited.

Perhaps Mr. Williams can tell us in the strict sense what is meant by "processing."

Walter S. Williams—I don't think I can answer that question, but I think whoever suggested this subject had in mind the use of the man in the actual work in the mill, and I can only speak in this connection of our own recent

experience. The concern with which I am connected has been taking the textile school graduates right into the actual work of the mill.

We were talking it over only the other day and we came to the conclusion that we had been very fortunate, because every one of the young men we have taken on in the last ten years has decidedly made good. In many instances, he has made so good that we haven't been able to hold him. We have lost him. (Laughter.) In other words, we have trained him for someone else. But we don't intend to let them get away, if we can help it.

Our system is very simple. We take the man in and put him on the actual running of a machine. We give him a chance to show what he can do. As soon as he has become familiar with the actual process of manufacture, we let him supervise some special process—it may be nothing but a sample piece that he is asked to run. If he shows ability with that small thing, it leads gradually to larger and larger responsibilities. As I say, these men have all been very useful to us, so that they are now right-hand men to our foremen, or are graduated from our plant to others.

It seems to me that that should be the attitude of the manufacturer to-day, where he finds boys who are willing to start in that way.

While we were discussing some of the previous subjects, I was thinking that one of the faults we find with the technically trained or the textile school trained boy is that he is a little bit too anxious for immediate promotion and responsibilities, which he is, as a rule, unable to assume.

That is about all that I can say on this subject. (Applause.)

President Olney—Is there any further discussion? There is much that could be said on this subject, I know. It is something that, in my experience, I constantly come in contact with, because I am sort of a middleman between the textile manufacturer and the technically trained graduate, and it is a problem many times. The demand at the present time, and for a number of years, for these technically trained men, has been greater than the supply. There is no question about that. That being the case, I think Mr. Williams' suggestion that they are too anxious to get ahead is perhaps partly explained, because they see their associates making progress, and they think they can do the same thing.

We all know that the young graduate will do better to stick to one thing for some time until he has mastered that, rather than jump to something else within a short time because a little better opportunity presents itself. The immediate result is very attractive, but in the long run he will do better to stay right where he is. That is a principle which I am constantly talking to graduates. I tell them not to be too anxious the first two, or three years that they are out in business; that they will come out all right in the long run.

Is there any further discussion?

A. L. Lustig—I should like to add to what you have said regarding the textile school graduates that not only would they be better off financially if they stayed in their own plants a greater length of time, but they would learn a great deal more, because when they stay there only a short time they merely scratch the surface. When they scratch the surface and pick up a few crumbs, they feel that they must make a change and better themselves. I think that in the long run they hurt themselves tremendously by making frequent changes.

I have no complaint to make, personally. We had only one case in our plant where there was a change, much to our chagrin. This was a man of great ability, a man who would have made good in every way, who would have been in a leading position to-day. We have three or four textile school graduates in our plant, and they have all stuck to their jobs and are doing very well indeed, but I had to impress on their minds, when they first came, that it was to their best interests to stick and they have done so. However, there is a difficulty there, although it isn't a financial one. I think that is the smallest part, after all. The compensation doesn't mean very much. It is what the man learns, and what he can give later on in life to his plant, and to himself, too—that is really the question.

I should like to make a few remarks, if I may, regarding the contact between the college and the plant. I think the great difficulty is that the college, in the first place, doesn't train men for our kind of work and that the plant as a rule does not look to the college for help.

I am inclined to emphasize Dr. Rose's statement. I am rather in favor of a broader culture, going very much deeper into the great principles that go into any man's life, that he gets through a college education. I don't believe that a real leader in our kind of work, a real big man, can be developed unless he has that sort of foundation, unless he is a very exceptional man.

Really, I don't believe we are treating the young men of to-day fairly if we let them feel that they can get the proper kind of education in any of our present textile schools, to become real figures in the industry. They must be real engineers. I don't mean half-baked engineers. They must be real chemists, not only have a smattering of chemistry. Then, outside of these things, they must be well-rounded men. If they have these qualifications, then it is comparatively easy for them to become leaders in the industry. Of course, the exceptional man will come through, whether he has this training or not but I think there are opportunities along this line in this country; more so, I think now than ever before.

Our New England industries require such men, and

there are opportunities for them there. There are a great many there to-day. I have met many young men of this type who have come perhaps not into our direct line, but into the mill itself.

So I hope some way will be found by which our college men can get textile training after they have gone through college. Similar things are done abroad, I believe. There are combinations abroad of college education and textile education, or something parallel to college education. I have met some of those men, and they have a different attitude towards life and towards the plant, I think, than the men who do not have that foundation.

I don't want you to take this as a criticism at all. I am simply trying to broaden out the field and show our friends here that there is plenty of room on top—and there is. Everyone is looking for the broadly trained man. We have industries enough here to take care of all the men we might train in that way. The plants in this country would be very glad to develop along those lines.

Do I make myself clear, Mr. Chairman?

President Olney—Yes.

I think what Mr. Lustig says bears out what I said earlier in the evening: that if we could have just what we would like at the Textile School, we would make it compulsory for every man to have a college training before he could become a graduate of our school. As we cannot have that, we have endeavored as much as we can in a four years' course to introduce such subjects as might broaden the man's point of view, in the way of methods of thought, and the application of facts to various problems. That cannot be done perfectly in four years anywhere.

Mr. Lustig—May I say something else in that connection?

I used to live in Lowell, myself, more than thirty years ago. I was a youngster then and I was perhaps more free to say what I thought than I should have been, but at that time I strongly urged a textile school in Lowell, and shortly after I left some of the powers that could see the light started it.

I know there has been a good deal of talk about this subject (at least, we have had a good deal of talk at Brown University, our local school) and I believe it could be developed if we would really pay a little attention to it and if everyone who is in a position to help the thought along would do his share. It may take more than a year or two, but ultimately it will come, the same as Lowell Textile School has been developed. I think this very idea will penetrate finally and come to the college. If we believe it is the right thing, we can put it over.

President Olney—While I believe that Mr. Lustig's remarks are to the point and fundamentally sound, it is my opinion that economically at least it would be better for graduates of such an institution as Brown University to take a post-graduate course at such an institution as the Lowell Textile School rather than attempt the duplication of a million and a half to two million dollars equipment in a number of places. Furthermore, I believe that far greater advantage could be taken by such an arrangement of the textile background to which I referred during my introductory remarks.

There is being considered at the present time the possibility of a five-year course at the Lowell Textile School leading to a Master's Degree. If such a course should be established it would be perfectly feasible for regular college students to so arrange their curriculum as to obtain this degree after completing two or three years of such post-graduate work.

We have here to-night some men representing the other side. That is, the subject deals with the value of technically trained personnel here. We haven't heard from them. I think it is no more than fair to give them an opportunity at least to express their views. I know there are a number of them here. We should be glad to hear from some of them.

Walter C. Durfee—I haven't very much to say, but I just had an experience with some technically trained men who made good and who saved us a lot of money. But it seems to me that their success was due about 50 per cent to technical training and 50 per cent due to diplomacy. If the technical men and the practical men have diplomacy, they can get results. Without it, they get nowhere.

That thought just occurred to me.

President Olney—I think that is very true. Diplomacy is a great thing most anywhere, whether it is in the processing department or somewhere else. Lack of it is fatal.

Logwood Dyeing in Silk

Mr. Bengs—I should like to ask the Professor a question. How is it that so very little assistance is given to graduates of textile schools in one field, namely, logwood dyeing on silk?

President Olney—Logwood dyeing on silk?

Mr. Bengs—Yes, sir. We are still employing that process to create black. We dye for many different purposes. We dye a single dye, a double dye, and a triple dye. We dye pure dyes; we dye weighted; we dye special blacks for velvets, and it is all up to the practical dyer. Every technically trained man we have ever come in contact with seems to be at a loss to explain the results. The practical dyer is still going by his results to-day.

That is a field, I think, in which a little more assistance could be given to the technically trained man.

President Olney—Dr. Killheffer makes the suggestion that some of these men who are interested in that subject take some of our graduates for a year or two, and see what they can do.

I might say, in this connection, that the New England textile industry, of course, is largely made up of cotton and wool, and a large proportion of our graduates have gone right into either the cotton or the woolen industries, and until recently there has not been so great a demand for men in the silk industry.

Mr. Bengs—Why has it never been possible to substitute something else for logwood?

President Olney—Well, I presume the answer to that is simply this; that up to the present time they haven't found anything that is better than logwood. (Laughter.)

Can some of the silk dyers answer that question a little more specifically than I have? The question is: Why have the—shall I say dyestuff interests, or textile colorists—not found something that will replace logwood on silk?

W. F. Deady—I am not a silk dyer, but I should like to throw out this suggestion: doesn't the weight that logwood gives the silk help out the dyeing? The impurities in the logwood act as a weight.

President Olney—Yes. I have never believed it, really, but some of the books say that you can increase the weight of silk more than 400 per cent and yet have a good black silk. When you increase the weight of silk 400 per cent, you get something on the order of an iron wire, when you get through, instead of silk, from my point of view.

Mr. Bengs—I am not talking about weight of silk only. I am talking about Logwood Black.

President Olney—Isn't it the advantage which is derived from that combination of logwood and weighting at the same time that delays the substitution of something else for logwood?

Mr. Bengs—Weighting with logwood is one thing, and pure dyeing of logwood is something else.

President Olney—Is there any further reply to that question?

A. L. Lustig—It is really only an optical delusion that makes Logwood Black look so much better than any other black. (Laughter.) That is the reason.

President Olney—I think Mr. Lustig has really answered the question.

Dr. E. H. Killheffer—With reference to Logwood Black, Mr. Chairman, I can't give the answer, but I think the gentleman who propounded the question is probably best qualified to give the answer, inasmuch as his experience has undoubtedly been very much greater than that of anyone else in the room. Therefore, I should like to put it a different way: What other blacks have you used in an attempt to make a substitution, and what were the reasons for the failure?

Mr. Bengs—I have used nothing but Acid Blacks, and they didn't compare favorably at all.

Dr. Killheffer—You couldn't get enough on, in the first place, to get your shade.

I think you probably can answer that question better than any of the rest of us.

Mr. Bengs—I think I can. That is just the reason why I am so surprised that in all my experience I have never run across something that could replace logwood. As a matter of fact, I am using a process now that I learned in 1881, and nothing has been suggested yet that might effect a profitable and economic change in that.

President Olney—If there is no further discussion, we will take up Subject 7, "Improving Washing Properties of Rayon."

Everyone seems to be interested in rayon. I am not surprised, because it is an interesting subject and there is a whole lot that is not yet known about the handling of rayon. I presume we have men here who are particularly interested in that phase of the subject—improving the washing properties of rayon. Is there any discussion? It is suggested that this subject will probably be covered in a paper to-morrow.

The last subject on the program for this evening is: "Effect of Repeated Washing Upon Textiles and Colors." Mr. Guernsey was unable to be here to-night, so that this particular subject will not be presented.

The plan with regard to this Open Forum is that anyone shall have an opportunity to say anything that he wishes. These subjects have merely been placed upon the program as suggestions. From this point on, the meeting is open to everyone, and I am going to ask Dr. Killheffer to preside during the latter part of the session.

. . . Dr. E. H. Killheffer assumed the chair. . . .

Chairman Killheffer—Has anyone anything to bring up at this time?

Vat Dyeing

Benjamin Verity—I was too modest to get up before. I shall now probably tell one of the secrets of vat dyeing. (Laughter and applause.)

Number 1—Use imagination together with your facts. How can you penetrate any kind of goods with vat dyes? First get your vat dye like milk, in a colloidal solution. Place your goods in the colloidal solution. Then pass your goods through the solution at the temperature at which they will reduce, straight into the hydrosulphite. (Laughter and applause.)

W. F. Deady—I should like to ask Mr. Verity how to get that colloidal solution? (Laughter.)

Chairman Killheffer—He uses Neomerpin.

Mr. Verity—Imagination.

Chairman Killheffer—No, I said Neomerpin. (Laughter.) I disagree with you.

Mr. Verity—Don't buy an expensive colloid mill. (Laughter.)

Take the vat dye and boil it with Monopole oil, or something similar, and a little gum, and after it is dis-

integrated or deflocculated, it cannot get together. (Laughter.)

Mr. Deady—I should like to ask if you ever get any trouble with dye spots that way?

Mr. Verity—Yes. But, again, get your dye spots, not on the cloth, but on a strainer. (Laughter.)

How do you clean milk? You put it through a strainer, don't you?

Chairman Killheffer—The next secret! (Laughter.)

A. F. Lustig—Talking about strainers, I should like to ask whether you could put vat liquor in a condition fit for dyeing through one of these Monel metal finished strainers that they are putting out now?

Mr. Verity—You wouldn't need that strainer. If you got it like milk, you could put it through anything, couldn't you. Isn't that a fact? You would have no difficulty in putting milk through a Monel strainer, would you?

Mr. Lustig—Well, I must express myself more plainly then.

You know, some of the dyestuffs are done in a reduced form. Some of them are applied to the fabric in the unreduced form, as you know, and they are reduced afterwards. Perhaps you will refer to that.

Mr. Verity—Get your unreduced form in the colloidal state. If you boil the colors with Monopole oil and gum, you will get it in that colloidal state. Then just pass it through a sieve. Work it through gently; milk it through the cloth. Put through a flannel, and you will get all the specks on the flannel, and none on the cloth.

Mr. Lustig—I think you are right, Mr. Verity. But the flannel might retain some things that you would like to put through. Outside of the specks, it might retain dyestuff, for instance.

Mr. Verity—If you get the dyestuff fine enough, it will go through that flannel.

Mr. Lustig—But I think our friends, the dyestuff manufacturers, have solved the problem to a large extent. We textile chemists and colorists aren't entitled to credit for that yet.

Mr. Verity—Yes. But they don't supply you the color in as fine a state as milk is. If you put milk on a piece of filter paper, you don't see any particles. If you take the color as you receive it from the manufacturer, mix it with water, and put it on a piece of filter paper, what will you see? (Laughter.)

Mr. Deady—I should like to ask Mr. Verity about how much Monopole oil he would use to a pound of dyestuff, to get that state of colloidal solution?

Mr. Verity—I will tell you. (Laughter.) This is a secret that you can all find out yourselves: Just you try it. Mr. Deady can answer his own question. (Laughter.)

Chairman Killheffer—And if it doesn't work, you come back to the next Annual Meeting with it. (Laughter).

Mr. Verity—I will tell you just one thing: In connection with vat dyes, you hear of 25 per cent seconds, and 10 per cent seconds. I have had seconds, but I always made them firsts. I never expected I could. I have had no more seconds from vat dyes than I have had from developed or direct dyes. That is a fact. I probably attended to the details, but I had to find out the details, first. (Laughter.)

Mr. Lustig—Referring to emulsifying the milk, you suggested gum. There may be dispersing agents there. How would a little glue work, for instance? This is a suggestion now, not a question. How would a little gelatin, or something of that kind, work in connection with vat dyes?

Mr. Verity—If I wanted to know, I should try it out. (Laughter.)

Mr. Lustig—Let me answer you then: Our experience is that gelatin is the very best thing you can use. It is way ahead of gum.

Mr. Verity—At what stage, and how?

Mr. Lustig—Well, that you will have to find out for yourself. (Laughter and applause.)

Chairman Killheffer—There are 150 men in the room and 200 of them want to ask you questions, Mr. Verity.

Who has the next question, please?

John J. Sokolinski—I was very much interested in your remark relative to passing milk through filter paper. If you had a colored filter paper, don't you think the milk would show? (Laughter.) The filter paper is white and your milk is white, and therefore you can't see it. Is that the idea?

Mr. Verity—Surely, the milk would have a color, but you wouldn't have any specks.

H. F. Herrmann—Providing the milk weren't sour. (Laughter.)

Mr. Verity—You used your imagination then. (Laughter.)

W. H. Cady—Mr. Verity, suppose you had a vat dye in powdered form. Can you get colloidal solution out of that?

Mr. Verity—Yes.

Mr. Cady—By the same method?

Mr. Verity—No. (Laughter.)

Chairman Killheffer—I think that is one of the things you will have to find out. (Laughter.)

Mr. Verity—No, I will tell him how to do it.

Take the powder, reduce it, in a sufficient volume of water, put a little gum with it, and then oxidize it with air—and you have it.

Mr. Deady—I should like to ask Mr. Verity if he grinds his colors?

Mr. Verity—No, never. I told you not to buy an expensive colloid mill.

Chairman Killheffer—There ought to be many more interesting questions. (Laughter.)

Mr. Lustig—As long as the question of colloidal mills has been brought up, what is the general opinion of those present with respect to a mill of any kind, a really good mill, such mills as are used by the dyestuff manufacturers?

Chairman Killheffer—Mr. Lustig, we have on the program for to-morrow what promises to be a very interesting paper on colloid mills. If I am not mistaken, the subject you mention will be brought up, if not in the paper, in connection with the discussion on the paper.

Of course, I know everybody here is accustomed to getting up at 5.30 or 6, but it is now within about thirty minutes of the time that most of the night clubs come to life, so I suppose a motion to adjourn is in order.

Mr. Deady—I move we adjourn.

Chairman Killheffer—I think even without the motion it might be well to adjourn until to-morrow morning at 9.30.

. . . Several announcements were made, following which the meeting adjourned, at 10.30.

COMMUNICATION

The Textile Chemist—What About Him?

[NOTE.—*The following communication was received since the Annual Meeting. It is written by one who was present at the Open Forum and was inspired by the discussion which took place in regard to "What Constitutes an Adequate Education for a Textile Chemist and Colorist." We therefore insert it at this portion of the Proceedings.*]

The discussion on the education of the textile chemist at the recent annual meeting of the A. A. T. C. C. brought out considerable sense and nonsense. There was just enough nonsense to make some of the younger members wonder if some of the older fellows have forgotten the day when they went looking for their first position.

A very able and forceful presentation brought home to us the lack of any broad and deep education in our industry, which is a very true fact. But is this condition peculiar to the textile chemist or to the textile industry? The daily papers of our large cities continually voice the same complaint about our doctors, lawyers, preachers, etc. I hold that it is not peculiar to either the textile chemist or to the textile industry, but rather is true in all lines and in all parts of our country. Because this is the case the textile chemist cannot be excused for following the crowd; it is more difficult for him to move against it.

The young graduate is also frequently thought to have or supposed to have a very good opinion of his ability and to think himself pretty clever in his particular line. Is this true or is it just the imagination of one person observing another who appears pretty confident of his ability? Would an employer hire a man who did not have confidence in his own ability or who did not think that he was worth the money he was going to be paid? He certainly would not. I think a careful check-up of one's business associates will find about as many cases of belief in personal ability among the graduates of the various schools of "hard knocks" as of textile schools or any other schools.

Again, the graduates of textile schools are often criticized for not remaining in their first positions, for being too ambitious and too anxious for advancement. Well, what is a young man's education for if it is not to advance him? Advancement means progress, progress leads to success and success in business is measured in money. (The money is not here considered the main object but a necessity only, to sustain life, health and a reasonable degree of comfort.) Can a young man, who admittedly knows *something*, be expected to work many years as a cog in a wheel for a small salary, in the hope of future advancement, if he has seen years of faithful labor of others disregarded overnight by a new management which brings in its own organization?

TOO AMBITIOUS?

Too ambitious? How come? Any executive who can't keep overambitious boys employed to the advantage of his company is a faker and should be replaced. It is said that successful New York brokerage houses will fire a runner boy in three months if he hasn't ambition. The textile industry needs more of it rather than less.

Many men who leave textile schools do not stay in their first places long because they take the wrong positions when they begin their work, for two or three reasons. Either they do not know the kind of work they want, they cannot find the kind of work they want or they must take the first position offered on account of personal circumstances. Under these conditions it is inevitable that there must be quite a little changing from position to position for the first year or two till the new worker finds himself and the kind of work he is adapted to. After all, each one of us is an individual with individual characteristics which fit us for different kinds of work. We would all make pretty plastic pegs if we could all adapt ourselves to the first hole we were pushed into.

Another reason for the change of men from position to position is the urge for experience, which is perfectly normal and proper if kept within proper limits. Of two men applying for a position, all other things being equal, the one with the most experience gets the place. Since there is so much to be learned about the industry, it is fair to say that it cannot all be learned within the four

walls of one plant. Therefore, why shouldn't a man move occasionally to broaden his outlook and improve himself? How many present day leaders in the textile industry refuse better positions with increased salaries for the privilege of remaining faithful to the old employers at smaller pay? Our guess is—not many. Then can anyone blame the textile chemist, who at twenty-five has just begun to hit his stride, if he tries to improve himself to the utmost by all ethical means from twenty-five to fifty? He doesn't get much chance afterwards.

It seems to us that there has been enough *"blah"* about the poorest side of the textile school graduate. He has proved his worth. Let us all admit that he is human—that he has as many faults (and no more) than any other group of men—that he is earnest, honest, and intelligent, equipped with a good education, eager to serve mankind —and at a moderate price.

What do *you* think?

MERRILL G. MORRIS.

SATURDAY MORNING SESSION

December 3, 1927

The Saturday morning Technical Session of the Seventh Annual Meeting convened at 9.35 a. m., Professor Louis A. Olney, President, presiding.

President Olney—Gentlemen, we have come together for the Seventh Annual Meeting of the American Association of Textile Chemists and Colorists.

In order to do justice to all who have offered to present papers and to allow an equitable time for discussion of each paper, the Council voted to have the program arranged in accordance with a strictly timed schedule, and they have instructed me to see that such schedule is strictly enforced. You will, therefore, understand that I have no choice in the matter, and I hope that no one will feel offended if they are advised by the gavel that their allotted time is at an end. One tap of the gavel will indicate that the speaker has one minute more and two taps that his time is up. In case any speaker or the discussion does not occupy the assigned time, we will use our discretion in its reallotment.

It has also been decided to hold the Business Meeting at the end of the morning session rather than at the beginning.

The first paper this morning is entitled "Work Done to Increase Resistance of Rayon to Water." This will be presented by Dr. John E. Jackson, Consulting Engineer, New York City.

Dr. Jackson! (Applause.)

. . . Dr. John E. Jackson presented his prepared paper:

Work Done to Increase the Resistance of Artificial Silk to Water

By DR. JOHN E. JACKSON
Research Chemist

The subject of the increase of the resistance of artificial silk to water is so big and embodies so many various factors that a really thorough treatise of the subject is more the scope of a textbook than a paper.

In dealing with artificial silk which has for its base one of our most complex compounds, viz., cellulose, we have to realize that the constitutional formula of cellulose is as yet unknown. If it were known, the chemistry of cellulose could be written in a few sentences.

A great deal has been written on the subject, most of which is still very much scattered, largely due to the different purposes for which the various experiments were conducted; as, for instance, the work done on cellulose for the explosive industry, lacquers, artificial leather, etc., and numerous minor industries, might never reach the attention of the chemist investigating cellulose for pulp and paper or for rayon. Until a system of standardization has been more thoroughly developed, a lot of unnecessary duplication of work and wasted time will take place and the patent office will keep on being clogged up with too many similar unpractical methods, many of which have been tried by certain industries and discarded, only to find their way into other industries, often with very disappointing results.

Much of the valuable work done in cellulose chemistry has been lost, also, due to the fact that the chemist employed in research for a given industry will discard many experiments which are worthless in his own line of research, but which might be very valuable in another field or in helping to fathom the elusive secrets of the chemistry of cellulose and allied carbohydrates.

Very valuable work was performed by men like Payen, Fremy, Haller, Cross, Beven, and later by Schwalbe, Heuser, Ost, Schoerger, etc., which has been of untold assistance in placing before the chemist, interested in the subject, data and references which otherwise would be a hopeless jumble of experimental observations and a few isolated facts and theories.

A UNIFORM CELLULOSE DESIRED

Much misleading experimenting has been performed because we have not succeeded in proving the true constitutional formula of cellulose, and many well-conducted experiments were made with impure material, such as mixtures of cellulose of a high molecular structure and its degradation products. Such results, although they serve a useful purpose, are very misleading.

In the making of artificial silk, it is the aim of the

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manufacturer to use as pure a cellulose as possible, and as that is not always an easy matter the next best course of procedure is to use as uniform a raw material as is obtainable. The specification in most rayon plants are about as follows:

Alpha Cellulose—Not under 85 per cent.
Hemi Cellulose—Not over 14 per cent.
Ash—Not over 0.3 per cent.
Resin—Not over 0.7 per cent.
Copper Number—Not over 3 per cent.

Hemi-cellulose almost invariably accompanies the higher molecular structured cellulose, and as there are so many various forms of hemi-cellulose, according to the source of the cellulose, the age of the plant from which it was obtained, the growing, soil and climatic conditions, etc., all of which have an influence on the ultimate composition of the hemi-cellulose.

In addition to these impurities we have to cope with the actual breaking down of the high molecular structure of the cellulose itself due to the treatment it received to free it from its impurities.

The molecule of cellulose is composed of glucose residues, and the number of units in the molecule is unknown, but is thought to reach as high as forty. It is easy to see that with such a large and complex molecule, the breaking of the linkage might occur in many places, giving a different disintegration product in each case, according to the treatment it has been subjected to.

With all these difficulties, one has to marvel at the results already obtained in this new giant industry of artificial silk.

The logical place to attack the problem of the resistance of rayon to water is at its base, that is, starting with the cellulose used itself. In making rayon, the cellulose is subjected to chemical treatment which greatly disintegrates the molecule so that when cellulose is regenerated in the filament it is not in the form of pure cellulose, but a mixture of cellulose and its degradation products. The difference in strength between the high molecular structured cellulose and the disintegrated cellulose can best be illustrated by comparing cotton with viscose.

There are also many conditions during the course of manufacture which are liable to affect the resistance of rayon to water, as for instance the nature of the spinning solution, viscosity, coagulability, strength of filament with reference to concentration of solution, filtration, air bubble removal, ripening, varying of the spinning process, drying, etc.

In connection with the comparison of the strength of cotton and viscose it is interesting to note that cotton has a strength of 11½ kilos (when dry) for threads 1 mm. in diameter, and 18.6 kilos when wet, while viscose silk has a strength of 11.4 kilos when dry and only 4.5 kilos when wet.

Tensile Strength Wet and Dry

According to Obermiller and Goertz, the tensile strength of (air) dry and wet single textile fibers, before and after extraction of their natural fats and waxes by means of benzine, were determined. Average results for 50 to 100 fibers indicate that the ratios of the wet and dry tensile strength of cotton, wool, natural silk, cuprammonium, viscose, nitrocellulose and cellulose acetate artificial silks are 110 to 120 per cent, 80 to 90 per cent, 75 to 85 per cent, 50 to 60 per cent, 45 to 55 per cent, 30 to 40 per cent, and 65 to 70 per cent, respectively, and that these ratios and the tensile strengths of individual fibers are not appreciably affected by extraction of the fat. The tensile strength of wet and dry fibers and also their ratios are considerably decreased when the dry fibers are exposed to a temperature of 75 to 100 degrees for 87 to 119 hours. For example, the ratios of the wet and dry tensile strengths of American Texas cotton, Indian cotton, merino wool, natural silk (degummed), cuprammonium silk, and viscose silk before and after the heat treatment were 114 and 108.1 per cent, 112.4 and 101.7 per cent, 89.4 and 85.5 per cent, 82.3 and 65.8 per cent, 59.7 and 52.0 per cent, 53.4 and 51.7 per cent, respectively.

The United States Bureau of Standards have published the following figures showing the breaking strength of the several kinds and sizes of rayon.

Fiber	Size Denier	Breaking strength in grams Dry	Wet	% Loss
Cuprammonium ...	150	173.9	40.7	76.5
Nitro cellulose ...	150	218.0	86.6	60.2
Viscose	150	190.0	74.6	60.7
Acetate	150	157.1	88.0	43.9
Silk (12 thread)..	138.8	515.1	416.3	19.1
Viscose	300	356.5	131.8	63.0
Acetate	300	335.5	186.5	44.4

The difference in elasticity of the various rayon fibers average as follows:

Fiber	Per Cent Elasticity
Silk	21.0
Viscose rayon	20.0
Nitro Rayon	15.5
Cupra Rayon	12.5

Although the wet strength of all kinds of rayon is much less than the dry, this defect is somewhat over-

come by increasing the twist per inch and also by mixing with cotton.

The effect of moisture on strength of fabrics when exposed to the air can be seen in the following table on goods subjected to a weathering test. After 100 days' exposure, the decrease in strength of the different fibers was as follows:

Silk	95%
Jute	70
Ramie	50
Linen	45
Cotton	40

There has been many treatments suggested to increase the resistance of rayon to water, to be used after the process of manufacture, but so far apparently none of them have given in practice results sufficiently good for their general adaptation.

If the problem is to be attacked by starting with cellulose itself a very critical progressive series of tests would have to be devised, starting with the plant that contained the cellulose, all the way down to the finished rayon.

Conditions Affecting Rayon Strength

It is surprising to note the number of possible conditions that can be found that would have a hearing on the ultimate composition of the cellulose. For example, it is astonishing the number of places that cotton, from the time it is harvested to the time it is delivered into the finished rayon, is subjected to conditions which places it at the mercy of bacterial attack which considerably alters the cellulose structure.

It is found that bacterial or fungoid attack of cotton considerably increases its solubility in alkalies and have caused a marked disintegration.

There are also the alternate heat and cold conditions to which it is subjected, and the alternate humidity as well; it may be exposed to sunlight and other agencies in hundreds of places where it receives treatments, all throughout the conditioning, washing and general preparation, and also through the manufacture of rayon, as, for instance, the aging at different stages and the ripening of the spinning solution. What takes place during these various treatments has never been positively ascertained, but it was proven by experimentation that they performed a necessary step leading to the present methods of rayon manufacture.

Among the many varied attempts to obtain a fiber that will be more resistant to the action of water, I will mention a few, some of which have helped considerably, but most of which have given only very meager improvements.

A recent thought that was suggested to me recently by an authority on the subject was that as we are depending on physical rather than chemical properties of rayon to give the necessary strength and other characteristics which are purely physical, we should work along those lines, and he cited, for example, the annealing of metals, glass, etc., to overcome internal stress and help proper crystallization or grouping of molecules according to their electrical charges. He made allusion to the various steps of aging of the cellulose in the course of processing as being comparable to annealing. The curing, rewinding and aging of ordinary photographic or moving picture film is an example of the application of that principle.

A certain process uses an infusion from the bark and needles of conifers, yielding coniferin and related compounds and introduces it to the coagulating bath.

It is also claimed by some that such substances as sodium oleate serves the double purpose of giving a more even thread and increasing its resistance to water.

A method used in England which has given interesting results is a method involving the use of chlorine in rather a novel fashion. The rayon is dried and in that condition is brought in contact with chlorine, either in the gaseous condition or dissolved in a suitable organic solvent. It is stated that by this treatment no oxidation or weakening of cellulose occurs, and in the case of dyed silk no undesirable changes in color is liable to take place. This treatment imparts new properties to rayon, and, in particular, it exhibits an increased resistance to the wetting action of water.

Another method keeps the precipitating bath at a constant composition by means of an electrical current, and by giving a more even coagulation the strength both wet and dry is increased.

Waterproofing by treatment with formaldehyde and lactic acid is used to some extent, and another process relates the use of aluminum acetate during desulphurization. Some use an N-substituted cellulose thiourethane and use strong acids, e. g., sulphuric acid of 25 to 65 per cent as precipitating agent instead of weak acids or other coagulants. Others completely waterproof their cellulose by treatment with thionyl-chlorite. Others varies the strength of caustic treatment in the making of the viscose, while others impregnates the fabric with a solution of cellulose thiourethane in which at least one hydrogen atom of the amido group is replaced by an alkyl radical. Still others use protein, such as keratin, fibrin, konchoelin, etc.

There are hundreds of various chemical combinations used in the precipitating bath and there are many solutions sold to treat the finished fiber, many of which undoubtedly helps, but none of which have succeeded in increasing the strength more than a few per cent.

There is no doubt, however, that a thorough, well directed research on the subject will yield very interesting, as well as remunerative results.

President Olney—This is a valuable paper and it deserves considerable discussion, but we only have one minute left, so that in that length of time we should be pleased to hear from someone.

Are there any questions? There seem to be none.

We will proceed with the next paper, "Dip Dyeing Hosiery," by Louis S. Zisman, of the Gotham Silk Hosiery Company.

Mr. Zisman! (Applause.)

Louis S. Zisman—Mr. Chairman, Members of the Association and Guests: This is really my first opportunity to address a technical audience, and I certainly appreciate the opportunity given me to do so.

The paper I am about to present was written more strictly from the technical dyer's point of view. The topic of my paper is: "Dip Dyeing Hosiery." I hope that none of you become confused and think that "dip dyeing" is something entirely new, as, I have learned, some people are under that impression. It is just another way of saying "dyeing hosiery," but it perhaps makes it a little more specific to say "dip dyeing."

. . . Mr. Zisman then presented his prepared paper:

Dip Dyeing Hosiery

By Louis S. Zisman

Gotham Silk Hosiery Company, Inc.

In almost every branch of textile dyeing, whether it be cotton, silk, wool or rayon, or a mixture of any of these fibers, the fixation of color may take place in the raw stock, yarn, or piece goods, but hardly ever in the garment, except in the redyeing of garments as is practised in dyeing and cleaning establishments, and in certain branches of knitting manufacture, chief amongst which is silk hosiery.

There is but little ingrain hosiery made to-day; i. e., silk hosiery in which the silk yarn is degummed and dyed before knitting. The bulk of silk hosiery is now dip-dyed, a process whereby the silk of the stocking is knitted in the gum together with any cotton that may be used for the feet or tops, the dyeing and degumming taking place after the whole stocking is formed.

The advantages of the latter method are many, the more important being the following:

1. The knitting operation itself is much facilitated, due to the protective coating of sericin or gum.

2. Production is made more rapid, due to less breakage and fewer seconds.

3. A wide range of shades can be more easily controlled.

4. Wearing qualities are increased, no loading materials are used which decrease the tensile strength of the silk fibers.

5. Cost of production is lowered.

Through the use of the dip-dyed method, manufacturers have been able to create a large market for silk hosiery, not only suiting woman's fancy insofar as the appearance is concerned, but actually bringing down the price to such a level that the price of a pair of silk stockings is no higher than a pair of high-grade cotton hose.

An outstanding hindrance towards the successful manufacture of silk hosiery is the dyeing itself. It was found a rather simple procedure to remove the gum or sericin from the silk in the stocking by boiling in soap, preferably a neutral olive oil soap, and it was thought the dyeing, too, would be a simple proposition; just to throw the stockings in a vat containing the right mixture of colors, and to boil the color through.

It wasn't long, however, before dyers discovered that there were such things as poor penetration of seams, splicings and "curly" portions of the feet, where the silk meets the cotton. Soap spots, oil spots, dye spots and streaks; some running parallel across the cotton or silk, others in blotchy effects were in evidence. With the increasing demand for large scale production, machinery became a necessity. First the paddle type was used, and then the Monel metal rotary type. The use of machinery brought on more complexities, such as chafe marks on the splicings, fuzzy goods, harsh feeling goods, uneven dyeing, difficulties in matching, etc. In short, the dyeings of dip-dyed hosiery, or the dyeing of silk stockings in the piece, came to be regarded as a distinctive branch in the field of dyeing; a branch which required in addition to general practical dyeing experience, a systematic study of the silk and cotton used, the chemicals and dyestuffs necessary, and above all, the type of equipment or machinery which could properly handle the dyeing of the goods.

Process Offers Chances for Improvement

Much progress has been made by some of the leading hosiery mills that have had enough foresight to study every phase of the dyeing question from a technical standpoint, and have taken whatever steps were necessary and possible toward the promotion of efficiency and the quality of the product handled in the dyehouse. In spite of all this effort, however, there is still ample room for improvement. The processes of dyeing, and the machinery available, are as yet far from perfect.

Let us examine this situation more closely and see wherein some of the major difficulties present themselves, also taking into consideration the means of reducing them to a minimum, in order to produce better dyed stockings, at possibly lower costs.

Perhaps one of the most important phases of any dyeing procedure, if not the most important, is the means of handling the goods. We must know what equipment or machinery can be used so that there be uniform and free

circulation of either the goods or the dye liquor. As a fundamental principle in dyeing, one of these two conditions is essential.

Up to the present day the only method of silk hosiery dyeing which has proved practical has been to move the stocking in the liquor. At first the stockings were poled in the wooden vats which contained the dye liquor, a rather crude, slow, and costly method, practised even today by some of the smaller dyehouses. The next step was to devise a mechanical means to move the goods. A reel-shaped paddle was fixed at the top of the vat, which instead of being rectangular was semi-cylindrical in shape. Both the paddle and the vat were later made of Monel metal. Then came along Monel metal rotary machines. This idea sprang up from the use of washers in laundries, the only difference being that the inner drum of the rotary machine was divided into perforated compartments, and a perforated pipeline was sunk at the bottom to permit the entrance of dye liquor, and the speed of the reversing action of the rotary machine was changed to suit dyeing operations.

The Monel metal rotary machines are widely used today because they help to speed up production, require less space and less labor, giving as good results as any machine yet devised for the dyeing of silk hosiery.

In the rotary type of machines the stockings are loaded either loose or in net bags so that there is even distribution in the compartments of the inner drum, which carries the goods around in an alternating direction in order to keep the stocking from tangling too much. The moving drum causes a certain amount of splashing of the dye liquor. The stockings in the nets or in loose form do not move freely in the dye liquor but are more apt to bunch themselves together in a tangled mass. By carefully noting the action or movement of the stockings we can readily see that the circulation of the goods is by no means thorough and that the movement of the liquor is but slight. Consequently the results at their best are far from being perfect, the method often lending itself to uneven dyeing.

Perhaps not enough thought has been given to the circulation question by builders of hosiery machines. It appears to the writer that the logical machine for the future will be a type that will keep the stockings stationary and circulate the liquor, perhaps by means of a spray system under pressure. At least one company has placed on the market a machine carrying out the idea of circulating the liquor. It is still in its infancy, and has therefore not proven wholly successful.

We can see now that the only method of "dip" dyeing for the present at least, is one which calls for the supreme test on the part of the dyer. He must use every known means and precaution to counteract the difficulty of circulation in the rotary machine. He finds that a retarded dyeing is necessary; that is, a dyeing where the colors are fed on and exhausted very slowly with the hope of permeating those tight areas which perhaps have not been well covered in the beginning through lack of circulation of the goods, and also penetrate more fully the seams, splicings, and "curly" parts of the feet where the silk meets the cotton. In order to accomplish this the dyer must take the following precautions:

1. *Bagging and Loading.*

Stockings should be thoroughly shaken out from their bundles, being careful that they do not mat together. The hosiery is then allowed to fall freely into nets supported on frames. It is better to use smaller nets than large ones; 24 x 30 is a good size. The bags should have a fairly open mesh. The stockings should not be packed too tightly but should fill the net. If too tight, circulation is made more difficult in the dye bath; if too loose tangling of goods will result. Care must also be taken not to overcrowd the nets themselves in the compartments of the machines.

2. *Selection of Dyes.*

The best level dyeing colors obtainable should only be used. Hosiery is one place where a "penny wise" in the saving of dyestuff cost may mean a "pound foolish" in the loss represented by redyes and throwouts. It is also well, of course, to select those dyes which have better fastness to washing and fading, since at their best the direct and neutral dyeing acid colors which have to be employed are only of moderate fastness, some being very poor.

3. *Addition of Color.*

The well dissolved, diluted and strained color should be fed on slowly, best at lower temperatures; the steam should be raised slowly; the temperature of both ends of the machine should always be the same. Dye formulas should be kept as accurate as possible, so that the dyebath receives the least number of additions, which have to be fed on at higher temperatures.

4. *Use of Salts.*

The dyer should be especially cautious about using salt. Excessive amounts not only tend to drive the color on faster, resulting in poorly penetrated parts, but also tend to break up soap and soluble oils used in dyeing, causing oil and soap spots. Glauber salt is to be preferred. In light shades it might be advisable to leave out salt altogether. If any salt is used to aid exhaustion it should be added after the dyeing is well under way. The beginning of the dyeing must at all times be retarded.

5. *Use of Penetrating Assistants.*

Neutral olive oil soap or a sulphonated oil (usually castor) are commonly used. Sometimes borax or phos-

phate of soda are added, but even though they are mild alkalies, they are not to be recommended, for if the goods run too long there is apt to be some harshness of the silk. The soap or oils are used for the purpose of softening the fibers so as to permit the entrance of color in the more difficultly dyed parts of the stocking. The penetration problem has led to the degumming and dyeing in one bath where the dyeing takes place in an excess of soap or degumming oil (which is usually a mixture of sulphonated castor oil plus silicate of soda). The use of degumming oils is dangerous when the goods are allowed to run too long—harshness resulting after the protective gum has been removed.

Dyehouse Troubles in Hosiery Dyeing

We might mention briefly some of the more common faults in the dyehouse other than uneven dyeing.

1. Dye Spots.—Caused chiefly by dyestuff dust getting into the dyehouse proper and settling on the wet goods when unloading from machines or extractors.

2. Soap Spots.—Caused by improper rinsing after degumming. Hardness of water makes this step more difficult and should therefore be corrected. Excessive salt in the dye bath, even if the water is but slightly hard, tends to break up soap.

3. Oil Spots.—Using poorly sulphonated oils in which the free oil separates out. Salts also tend to break up the oil, especially when the water is not soft.

4. Mildew Spots.—Usually appearing faintly bluish in color, formed when goods after extracting are allowed to lie around too long in damp muggy weather. These spots are more visible in light shades.

5. Streaks on Cotton and Silk.—Dark streaks on the cotton, especially on the heavier shades, such as Gun Metal, Cannon, Dark Gray, Dust, Cordovan, are liable to occur when using a direct blue, violet, or black, which bleeds badly. If the extracted stockings, in their damp condition, are allowed to lay overnight or longer, as may be found necessary, the fugitive color bleeds off and settles on the cotton. It is best to change the dyestuff, if possible. But it may be advisable to add a small amount of common salt in the last rinse water to partially prevent bleeding. Streaks may also come from many of the neutral dyeing Acid Reds which are highly sensitive to certain atmospheric conditions. Greenish yellow streaks are liable to occur on the silk when the extracted goods are left around too long and not kept uniformly damp until ready for boarding. Warm air, heavily laden with moisture, and containing even traces of any reducing substance, i. e., sulphur gases, influence the formation of such streaks, especially on those parts of the damp, extracted stockings which dry out first.

6. Chafe Marks.—Caused by the friction at tightly knitted parts in the stocking, i. e., the splicings and silk feet which are tightly knitted in order to increase wear. The danger lies in running the dyeing machine too long. The longer it runs the greater the friction will be. The chafe marks, which injure the silk itself, are more visible in the darker shades.

That is, you have chafe marks because the splicings and silk feet are tightly knitted for the purpose of increasing wear. But I notice that I left out a very important feature which I might mention just at this time, as it comes in order at this point. This feature is probably the greatest detriment to chafe marks, a common trouble in silk hosiery dyeing. Some manufacturers, for the sake of knitting as tightly as possible the splicing or foot of a silk stocking, mix boiled-off silk, that is, silk already degummed, together with bum silk. From my own experiments, I have come to the conclusion that it is the boiled-off silk in there which hasn't a coating of gum that really gives rise to these chafe marks. If all the silk were in the gum, there would be less tendency to have such chafe marks; in fact, there would be very little tendency.

7. Harshness.—Comes from using free alkali on the naked silk or working goods too long and too many times in the machine, as in stripping and redyeing. The silk fiber is weakened.

8. Fuzziness.—Caused by rough parts in the machine or using nets which are too coarse.

There are other defects in the finished stocking which are chiefly mechanical, due to variations in the silk, variations in the mercerized cotton, defects in the knitting structure, sleazy knitting, etc. The dyer should be well acquainted with these irregularities.

It is only through the combined efforts and co-operation of all the departments of the silk hosiery mill that we may hope to bring "Dip-Dyed" stockings to higher limits of perfection.

(Applause.)

Discussion of Hosiery Dyeing

President Olney—We have about three minutes for the discussion of this paper, so if you have any questions, or any remarks, just speak right up.

G. O. Linberg—Mr. Zisman, what is your particular objection to the Hussong type of machine, which is used extensively in the dyeing of silk hosiery, and which also gives very good production, due to the fact that a cage can be filled while another one is being dyed, and one can be finished while another cage is being dyed?

Mr. Zisman—I am afraid I can't answer that question well because I haven't personally used the Hussong machine for hosiery, but some representatives have come around from the Hussong Company. However, personally, I don't know of any mill that is using it. I don't

think the results obtained by the use of that machine are any better than those obtained from the use of the rotary type. I know that it takes longer to handle. The rotary type is about the fastest machine there is for handling, and that is a very important feature. I know that the Hussong machine has been tried more or less experimentally, but I don't personally know of any large mills that are using it. Perhaps there are. I would like to be informed if there are.

M. H. Goldman—I understand that the Phoenix Hosiery Mills, in Milwaukee, are using the Hussong for dark shades.

Mr. Zisman—How does it work out for light shades?

Mr. Goldman—They are not using them for light shades, as far as I know.

Mr. Zisman—The reason they are using them for dark shades is that with dark shades you can take more of a chance. There is less chance of getting uneven colors, but if you aim for uniformity, I believe a type of machine that will suit all purposes is the best, because the way most mills are run they have to keep on changing their colors continually. Some seasons they may have all light colors, and some seasons darker colors. To-day, in hosiery dyeing, they are tending to darker colors all the way through. Of course, there are certain staple light shades that are still in vogue.

President Olney—Are there any other questions? If not, we will take up the next paper, "Kieropon, a New Process for Bleaching Colored Stripe Cotton Material," by A. R. Thompson, Jr.

Mr. Thompson! (Applause.)

. . . Mr. Thompson delivered his prepared paper:

Kieropon—New Process for Bleaching Colored Stripe Cotton Material

By A. R. Thompson, Jr.
Rohm & Haas Company

The bleaching of cotton piece goods containing vat dyed rayon or cotton decorations has been increasing rapidly since the introduction of chlorine fast dyes. This type of work has presented the bleacher and finisher with a problem of how to get the best white, free from motes, etc.; protect the colors against bleeding or fading out; to obtain the proper feel or finish; and to keep the cost down to minimum.

Former Methods

Caustic Boil and Chlorine Bleach.—The methods which have been in common use for bleaching all white fabrics for many years gave the desired whiteness, with freedom from motes and allowed the proper finish to be obtained at the very lowest cost, but the severe kier boiling with caustic soda and other alkalies was not suited for bleaching colored striped material, because the colors would bleed or mark-off on to the white, and the hypochlorite (chemic) would not remove the dye stains caused by the alkaline boil. Bleachers have been searching for a long time for a process of bleaching colored stripe piece goods such as handkerchiefs, shirtings, damasks, huck and Turkish towels, colored bordered sheetings, vat dyed ginghams, and all types of fabrics containing fast colors on both low and high grade cotton, without materially increasing the cost of bleaching.

Peroxide Method.—The peroxide method was the first really satisfactory method to be brought out for bleaching colored goods, but the cost was considerably higher than the old caustic boil and chlorine bleach. It was necessary to put the gray goods in the kier and "boil" for eight to twelve hours at a certain temperature, about 175 to 180 deg. Fahr. If the kier was not packed uniformly there would be channeling; and if the temperature was allowed to drop or go over certain limits the bleach would be poor or the colors affected slightly, and possible tendering might follow if the temperature went too high.

New Method

Kieropon Process.—The new process, commonly known as the "Kieropon Method," combines all of the advantages of the caustic soda-chlorine bleach such as proper whiteness and at practically the same cost as the usual kier boiling method; and without affecting the colors or impairing the finish. It has the further advantage of requiring only simple and inexpensive equipment, and the installation of kiers and other high-price machinery is no longer necessary when constructing a colored goods bleachery.

There are two or three basic principles in bleaching as well as dyeing, i. e.:

1. The liquor is circulated through the goods.
2. The goods are moved or circulated through the liquor.
3. Combination of method one and two.

When Kieropon process was first brought out the colored goods were boiled in a kier with or without pressure containing about 3 per cent of caustic soda together with a small amount of soluble oil and silicate, and about 2 to 3 per cent of Kieropon for fourteen to sixteen hours in the same manner as white goods are boiled. The Kieropon served to protect the colors from bleeding in this strong alkaline boil, and, of course, the caustic and other chemicals served their regular purpose, such as softening and destroying motes, and preventing iron stains, etc. The goods were then washed and bleached with chemic in the usual way. The results obtained were satisfactory, but there was no particular saving effected as long as it was necessary to use 2 to 3 per cent of

Kieropon, and there was no other saving to balance the extra cost over the regular white bleach.

The latest method for using the Kieropon process is much more economical and satisfactory in every way, and may be adjusted to suit different requirements of finishes without any difficult changes in equipment.

In discussing this process, it will be more convenient to consider it as containing two principal operations:

1.—Boiling-out or "Bottoming."

2—Bleaching Proper

Boiling-Out

The goods are bottomed by saturating them thoroughly with the boiling caustic soda-Kieropon liquor, and allowing this solution to act on the material for thirty minutes to fourteen fours This may be accomplished by many different methods, with the goods either in the rope form or open width. The material does not need a desizing treatment previous to this operation, as the boiling caustic soda liquor solubilizes the various starches and they are removed in subsequent operations.

Machines Used in Boiling-Out

Quench Box on Singer.—When shirtings, handkerchief material, table damask, etc., are to be singed, there is great saving in expense and time to combine the singeing and boiling-out operations. The quench box is filled with a 1½ to 3 per cent solution of caustic soda containing between 3 to 5 pounds of dry Kieropon and generally about 3 to 5 pounds of a good soluble oil per 100 gallons of solution. The soluble oil should contain a high percentage of pine oil or some other effective penetrating assistant to aid the caustic in thoroughly softening the hard motes and waxes present in the lower grades of cotton. This solution of caustic soda, Kieropon, and soluble oil is brought to a boil and the goods are run through in the open width while being singed. The quench box should be large enough to allow the goods to stay in the liquor long enough to become thoroughly saturated and should have four or five rollers, at the top and bottom, long enough to permit the material to pass through in full open width. The steam pipe (closed or perforated) should extend the full width of the box so that an even temperature is maintained throughout the bath. The box should also be large enough to allow the liquor to be kept at the boil during this operation without overflowing. A float valve to preserve a constant level of liquor aids in producing uniform work by keeping the volume of liquor constant in the quench box. A reservoir tank containing 500 to 1,000 gallons of caustic-Kieropon liquor of the same strength as is being used in the quench box is employed to keep the volume of the boiling-out box nearly constant. A temperature control device on the steam line also helps in keeping a uniform temperature in the boiling-out box.

After the goods pass through the boiling caustic-Kieropon solution they are squeezed lightly and packed in a concrete or wooden pit, or a well-lined box for several hours or overnight. The steeping pits should be very close to the boiling-out box to prevent the goods from cooling off after passing through the squeeze rolls. The temperature maintained in the steeping pit is very important; in order to thoroughly digest the large motes in low grade, uncombed cotton, the goods saturated with the caustic and Kieropon, must be kept very hot while steeping. A temperature of 70 to 80 deg. Cent. (158 to 176 deg. Fahr.) throughout the pit is generally enough to soften the motes and give the cloth a good bottom for the chlorine bleach. Cleaner cotton, and lighter weight fabrics do not require as high a temperature in the steeping pits, nor as much caustic or Kieropon in the boiling box as the lower grades of cotton cloth, particularly when the latter is woven tightly with hard twisted yarns.

The general relation of caustic soda, temperature and time required may be expressed as follows:

When K = a constant for certain grades of gray cloth.
C = concentration of caustic-Kieropon liquor.
T = time goods are allowed to steep in the caustic-Kieropon liquor.
H = temperature maintained in boiling-out box and steeping pits.

Then $C \times T \times H = K$; or, in other words:

The product of caustic-Kieropon concentration (C); and the time the goods steep in contact with this liquor (T); and the temperature maintained (H) equals a constant for a given grade of cloth: e. g., if the concentration of the caustic is increased beyond certain limits, the length of the time required for steeping may be reduced providing the temperature is not changed; it also follows that if the temperature drops slightly below certain limits, it is necessary to increase the concentration of the caustic-Kieropon liquor to obtain the desired action on the motes and other impurities in the cotton cloth. The temperature in the steeping pit and the concentration of the caustic are slightly more vital factors than the time allowed for the steep after the goods have stood for a minimum time of about forty-five to sixty minutes.

Rodney-Hunt Slack Washers.—This type of machine may be used in the Kieropon process with very satisfactory results, and it possesses certain advantages, although the production obtained is not quite as large as by other methods. When it is necessary to rush the colored striped material through the bleachery quickly, a battery of 3 to 5 Rodney-Hunt machines allow the bleacher to eliminate the diastofor or desizing steep.

The gray goods are entered dry into the first machine which contains a solution of caustic soda (.5 to 1.5 per cent solution) and 2 to 4 lbs. of Kieropon per 100 gallons of liquor with a small amount of pine oil or other suitable solvent to aid quick penetration. This solution is kept at a temperature ranging from 190 to 210 deg. Fahr., and the goods are allowed to stay in this machine for twenty to thirty minutes. The goods are squeezed thoroughly before leaving the machine and are then entered into a second slack washer having a plentiful flow of fresh water, which removes the caustic-Kieropon liquor. The third machine contains a solution of soda chemic of 1 to 2 deg. Tw. at 90 to 95 deg. Fahr. The goods are allowed to stay in this machine for twenty to thirty minutes. They are then washed and antichlored immediately; or as an alternative method the goods can be run through a weaker chemic solution and allowed to steep in a pit for one to two hours before the final wash and antichlor. The wash and anti-chlor may be accomplished in the Rodney-Hunt machines or the regular washers commonly found in any modern bleachery.

It is advisable to have perforated partitions in the Rodney-Hunt machines to prevent the cloth tangling. If the machine is constructed properly it can be speeded up quite considerably without causing trouble when the perforated partitions are used. Slack-end boxes are generally used between the different machines, if necessary.

This method is very well suited for bleaching Turkish towels where no strain should be placed on the warp and also for bleaching low-grade cotton materials that contain a large percentage of heavy motes. This method is also well suited for light-weight fabrics made of finer grades of cotton, althought it is not necessary to give as harsh a treatment in this case as it is with the lower grade and heavier weight material.

Other Types of Equipment for Caustic-Kieropon Boil.—There are so many different types of machines that can be used for this process that it would be almost impossible to list them all, and individual firms have worked out special although very simple plans of obtaining the necessary saturation of the goods in the boiling caustic-Kieropon solution. Some machines are run in combination with the mercerizing frame, with very satisfactory results, on special work; another very good arrangement is to drop the goods from over a reel into a cement saturating pit, connected with steam coils, etc., which contains the boiling caustic-Kieropon liquor. The goods float around in this solution for a short time and are then pulled under a bar at each end of the pit, up through the squeeze rolls, thence to the steeping pit for several hours. Another method is to thoroughly saturate the goods with the strong caustic-Kieropon liquor and then pass them immediately into a specially constructed large Gant or "J" piler for forty-five to sixty minutes and then chemic, etc., as described under "Bleaching Proper." This method is best suited for cleaner cotton, as there is not quite enough time allowed for the caustic to soften the motes in the lower grade cotton for the bleaching operation. However, this method is adaptable to lower grades of coton, when they are bleached by spraying the chemic over the material for two to three hours.

Bleaching Proper

After the material has been prepared by boiling in the caustic-Kieropon liquor and allowed to steep several hours, it is ready for the bleaching operation generally given to regular all-white goods.

Brown Sour.—The material is usually washed thoroughly in the regular bleachery washers and then soured lightly to destroy the Kieropon color and aid in giving a quicker and whiter bleach, as the effectiveness of the chemic is reduced, if any Kieropon is left in the goods. The Kieropon is a brown-colored product and stains the goods a light yellow color during the steep, which is removed by a sour with ½ to 1 deg. Tw. sulphuric acid treatment. It is not always necessary to have the goods stand after this brown sour, but an acid steep of about fifteen to thirty minutes aids materially in destroying the hard motes and completely neutralizes the alkali left over from the caustic steep and usually gives a better white. It is not absolutely necessary to sour here if a stronger chemic solution is used and the goods are allowed to steep in the chemic longer.

Washing.—The material is washed free from acid before going to the next operation: Chemicking. This washing can be omitted if the goods are not given a brown sour.

Hypochlorite Bleach.—The material coming from the washer should be squeezed as dry as possible before entering the chemic, in order to allow the goods to absorb as much of the bleach liquor as possible. The process from this point on is similar to the regular method for white goods except the soda chemic is run slightly higher for colored goods; e. g., 1½ to 2 deg. Tw. and from 80 to 100 deg. Fahr. When using a lime chemic the strength of hypochlorite should be decreased considerably to allow for the increased activity which the lime chemic has on the strength of the cotton. Although it is not good practice to heat the chemic solution beyond certain limits, we have experienced no trouble with soda chemic solutions of 1 to 2 deg. Tw. when used at 90 to 100 deg. Fahr. The warm chemic works quicker and gives a better bleach in less time than when the same strength of chemic is used cold.

There are several methods of applying the hypochlorite (chemic), each having certain advantages over other methods for certain types of work.

Rodney-Hunt Machines.—This type of machine is very satisfactory for bleaching terry towels where no strain should be placed on the warp threads; and on other fabrics that need a real thorough soaking in a plenty of chemic for about thirty minutes to give the desired bleach. The production by this method is apt to be considerably lower than by other processes but it gives a continuous bleach.

Spray Pits are excellent for bleaching low-grade cotton, Turkish towels, etc. The goods are piled in a wooden or concrete pit provided with a pump and the chemic is circulated through the goods for about one to two hours.

Continuous Chemic Saturator.—This type of bleaching equipment is used on all types of fabrics and gives the greatest production. The chemic is placed in a concrete pit provided with a bar at each end to insure complete immersion; and a set of squeeze rolls to remove the excess of chemic. The goods are pulled through this solution, between the squeeze rolls and allowed to stand for three to four hours. If the white is not satisfactory or the motes are not removed completely the goods are washed and the operation repeated.

Conclusion

The Kieropon process has many ramifications which render it difficult to discuss fully in such a paper as this, but the author does not hesitate to prophesy that it will eventually replace all other methods of bleaching colored goods now in use, because of its cheapness, effectiveness and future possibilities that are yet to be disclosed.

Kieropon is an organic chemical that is sent out as a moist dark brown crystalline powder. If exposed to very strong heat, say 167 to 176 deg Fahr. (75 to 80 deg. Cent.) it decomposes rapidly with the formation of large volumes of brown smoke. Therefore, it must be kept away from hot steam coils and from the heat of the sun.

The Kieropon process is the invention of Dr. Charles S. Hollander, of the Rohm & Haas Company, who, for a number of years has given to the problems of bleaching considerable time and study. Credit should also be given to P. H. Del Plaine and E. L. Helwig, of the same company, for their technical work on this subject.

On the table, on my right, there are a large number of samples of practically every type of cotton piece goods which is apt to contain vat colors. There are mercerized shirtings, handkerchiefs, ginghams, table damask, Turkish towels, huck towels, rayon filled dress material, fine lawns—every type of fabric made from the very highest to the very lowest grade of cotton.

Those interested in seeing these samples may do so after the morning meeting is over, and I shall be glad to answer any questions that you may ask, or show the samples and explain them at that time.

There are a few samples of particular interest that I want to call to your attention.

You will remember that I stated in my paper that the use of Kieropon would permit vat colored stripes to be boiled with caustic soda under pressure, if necessary. Our first experiment with this process was conducted with about 1,000 yards of shirting and handkerchief material, including rayon stripes in the center of a regular kier of pajama checks, and it was boiled for sixteen hours under 15 pounds of pressure, with 3 per cent of caustic soda and 2 per cent of Kieropon on the weight of the goods and then bleached with chemic as usual. These are the samples from that particular lot. The process is not being used in this manner at the present time, but if you find it necessary and want to kier boil your colored goods under pressure, it can be done. However, it is not the most economical way of doing it, and is not recommended to you.

This table contains samples of work which have been done by all of the different processes.

Discussion of "Kieropon"

President Olney—We will now proceed with the discussion of this very interesting paper.

A. L. Lustig—Can Kieropon be used in bleaching ordinary cotton?

Mr. Thompson—Yes, sir, but it has no advantage, unless there are vat colors there to be protected. The Kieropon process can be used to very good advantage on low-grade cotton cloth containing large quantities of motes, where the cotton is dyed with a vat color in the raw stock, spun into yarn and woven in a piece of solid color. The Kieropon is used in this connection to keep the full shade rather than to merely prevent the color bleeding into the white portions of the fabric. The caustic used softens or removes the motes and subsequent chemicking brightens the entire fabric. This method of producing vat dyed fabrics in solid colors eliminates the danger of unevenness sometimes encountered when dyeing certain vat colors on piece goods in the jig or pad, and the shades produced this way possess the highest degree of penetration and fastness.

President Olney—Are there any other questions?

H. R. Davies—Do I understand from Mr. Thompson that Kieropon is purely a protective agent, and has no actual cleansing or wetting out properties?

Mr. Thompson—Yes, sir, that is right. It is a protective agent for the colors.

Mr. Davies—Vat colors principally?

Mr. Thompson—It will protect sulphur and naphthol colors, too, but, of course, sulphur colors will suffer in the chemic. There is one Sulphur Black that will withstand a light chemic, and that is being used on ginghams and other materials that are put through this process. It

is the only Sulphur Black that I know of which will stand the chemic.

G. A. Moran—Would you say this was an oxidizing agent, a reducing agent, or a wetting-out agent?

Mr. Thompson—Kieropon is an oxidizing agent or a product which is easily reduced. The reducing action, created by the caustic acting on the cotton and its impurities, reduces the Kieropon, before the vat colors are acted upon, thereby preventing the vat colors from being reduced. All of the reducing action is taken up by the Kieropon, and there is no reducing agent left to attack the color. As long as the color is not reduced, it will not bleed or mark off.

President Olney—Dr. Hollander is here. He is one of those who devised the process. If he would care to speak for a minute, we would be pleased to hear from him.

Dr. Chas. S. Hollander—I have nothing to say.

President Olney—Are there any other questions? These samples will be here for your observation after the session is over.

If there are no further questions or remarks, we will pass on to the next paper, "Methods of Handling Cotton and Rayon Piece Goods in Dyeing and Finishing Department," by John F. Warner, of the Pacific Mills, Lawrence, Mass.

Mr. Warner! (Applause.)

. . . Mr. Warner presented his prepared paper:

Some Methods of Handling Cotton and Rayon Piece Goods

By J. F. Warner
Assistant Superintendent, Pacific Mills

The handling of cotton and rayon piece goods is rapidly becoming a specialized branch of the textile finishing industry, and it is the purpose of this paper to briefly review what might be termed some of the present-day standard practices. As is well known, there was a brief period a few years ago when practically every cotton piece goods bleachery and print works advertised their ability to handle the new rayon fabrics, and this fact, coupled with the attempts of all sorts of cotton piece goods selling organizations to merchandise cloths which were as equally unfamiliar to them as they were to the finishers, led to the flooding of the market with a large amount of poorly finished, and poorly merchandised rayon fabrics. As a result, the consumer lost interest for a while in rayon.

Gradually conditions became stabilized, however, and a comparatively small number of cotton and rayon constructions took their places as staple cloths in the market. At the same time, the weaving and finishing of these mixed goods became concentrated in a small group of mills and finishing plants which made their correct processing the subject of intensive study and research. Of the various chemical varieties of rayon, it is unquestionably true that the one produced by the viscose process is generally favored by the manufacturer of cotton and rayon fabrics which are dyed and finished as piece goods. The viscose product is now put on the market in a fairly constant form, and by the practical bleacher and dyer may be looked upon as a regenerated cellulose which has many points in common with cotton.

When working with the two fibers the physical difference is of much greater importance than the chemical, and this will continue until the manufacturers of rayon succeed in developing a much stronger and more durable fiber. Many of the faults still found with the dyer of rayon are due to lack of appreciation of the relative difference in the strength and elasticity of the rayon fiber as compared to the cotton fiber. Viscose rayon is one of the purest of the textile fibers, and mat grades would require no preliminary scouring or bleaching before dyeing were it not for impurities such as dirt and oil which accumulate in the manufacture of the cloth. Quite often, however, the cotton used in connection with the rayon is of a poor quality, not combed, and as a result a vigorous cleaning is needed. If the cloth has a cotton warp with the rayon introduced in the filling, it will require malting to remove the starch materials used in sizing the warp yarns. The malting may be carried out at the singeing machine or if singeing is not required, the cloth may be run through 5 per cent of a malt extract on a two-bowl padder. In the latter case, care must be taken to see that the cloth is threaded up loosely and that all guide rollers are smooth and easy running in order to prevent fraying. If the rayon is in the warp, a mild scouring with soap and weak alkali will usually remove whatever size has been used in slashing.

Care Needed in Sizing

In this connection care must be exercised in sizing rayon yarn, and it is safe to say that the quality of the finished fabric made from rayon warps depends largely on good results from the slasher room. The size box should be as close as possible to the drying cylinder, and the warp not immersed, but merely receiving the film of size liquor carried around by the roll running in the mix, in the same manner as "slop-padding" is carried out in the dyehouse. This will prevent excessive stretching of the wet yarn, and thus help in securing an even dyeing.

One of the requirements of most cotton and rayon cloths is a smooth face when finished and this necessitates singeing. For this operation a gas singer with not more than four burners of the split type is required. In the case of plain weaves, such as "rayon alpacas" or "chiffons," the quality of cotton used in the warps determines the amount of singeing necessary. For rayon face fab-

rics, of which satins and dobby figured goods are representative, one or two burners with reduced pressure will suffice.

Whether the cloth should be run straight across the flame or up and down seems to be largely a matter of personal choice, although it is safe to say that for lightweight goods there is less danger if the former method is followed.

For the better grades when a very light singeing is required, it is possible to use a regular silk beamer equipped with burners.

After singeing and malting the cloth is ready for scouring and bleaching. Much has been writen "pro and con" as to the necessity of kier boiling cotton and rayon piece goods, but it is now recognized that this is largely dependent upon two factors: first, the quality of the cotton used, and second, the amount of rayon in the fabric. Broadcloth shirtings, heavy coutils and other firm constructions with small rayon stripes or effects may be boiled in pressure kiers with caustic soda in much the same manner as all cotton piece goods, and the processing of these fabrics is almost entirely being handled by the larger cotton bleacheries and print works.

No exact formulae as to the quality of caustic or bleaching assistants are necessary, as these depend upon local conditions and requirements. If due care is given to the physical handling of the fabric, the rayon will withstand the chemical treatments required to properly bleach the cotton.

After kier boiling, the usual washing, souring and washing operations are carried out in the rope form, after which the cloth is bleached with sodium hypochlorite and piled in bins. It is then well washed in the rope state, treated with an anti-chlor, and again piled down previous to drying. While heavier grades may be successfully opened on a scutcher, the safest procedure is to open the cloth to full width by hand over a "moon board," and then lightly mangle before passing over drying cans.

The gain or "stretch" is an important factor to the finisher, and bearing this in mind it is undoubtedly cheaper to process in the above manner all types of cotton and rayon piece goods which are not injured by the long handling required.

For lighter weight fabrics such as rayon striped voiles, scouring and bleaching in slack washers gives good results, and when three or more of these machines are hooked up in range it is possible to treat the goods very quickly. Here again the quality of the cotton determines the length of time required, and the number of units through which the cloth is run. If scouring alone will clear the cloth sufficiently for dyeing, three of these reel washers are arranged so as to allow for a soaping in the first two and a warm water wash in the third. For such work a good grade of olive oil soap made up 3 ounces to the gallon gives a thorough wetting out and scouring. The cloth is run continuously in the rope state, and from the last washer may be trucked to the dyeing kettles without being dried. An arrangement of this sort will keep sufficient prepared cloth ahead to take care of a battery of four or more reel dyeing machines.

Bleaching in a Continuous Run

If bleaching is required, as is the case for whites and light tints, it is possible to group six or eight machines of the Dolly washer type, so as to complete the scouring and washing in a continuous run. If the larger number of machines is available, the routing may be varied according to the construction of the goods and the amount of handling needed to obtain good results. Particularly for styles which are subsequently to be printed it is essential to obtain a good "bottom" during preparation, and this entails the complete removal of sizing materials, cotton waxes and all other impurities. In no other way is it possible to obtain a clean, sharp print.

For small orders, all of the above preparatory handling may take place on a single reel dyeing machine, and this is the plan followed in most dyehouses for runs up to 2,000 yards. After the successive steps of scouring and bleaching, the dyeing is carried out on the same machine.

At times rayon and cotton crepes are in demand, and the processing of such fabrics in general follows along the lines already outlined, with the addition of a run in the "dash wheel" or "laundry machine." The length of time the goods are tumbled in this machine varies greatly, depending on the construction of the cloth and finish desired, and may run from one minute to twenty minutes or more. An olive oil soap made up one-half ounce to the gallon is usually the only scouring agent used, and from the laundry machine the goods are loaded in the dye kettles. If bleaching is required, this may be done in the reel machine with 3 deg. Tw. sodium hypochlorite, running the goods cold for one hour or more, depending on the degree of whiteness required.

If special equipment is not available, scouring and bleaching may be successfully carried out on the jigs. A typical treatment for a 1,000-yard roll consists of giving the cloth four ends at 140 deg. Fahr through sixteen gallons of water, to which has been added 3 pounds malt extract, then running for six ends through a fresh bath at 160 deg. Fahr. made up of 1½ pounds chip soap and 4 ounces of tri-sodium phosphate in 24 gallons of water. The roll is then washed through hot water and cooled down in one end through cold water preparatory to bleaching. Eight to ten ends through 6 deg. soda chemic, followed by two wash waters, then a fresh bath of bisulphite of soda and a final cold water wash develops a good white and a fairly well-bottomed result, which for plain dyes

will give level results. If preparing for printing, it is desirable to have the cloth as absorbent as possible, and if the runs are fairly large kier boiling usually gives the cheapest and best results. However, if the equipment is not available or the construction of the cloth will not permit, satisfactory results may be obtained on the Dolly washers or jigs.

In any of the above methods, peroxide may be substituted as the bleaching agent in place of the hypochlorites, but it is not being generally used for cotton and rayon piece goods.

It is upon the dyer that the responsibility is usually placed if the finished result is not satisfactory, and for this reason a great amount of chemical control is necessary if consistently good results are to be obtained on cotton and rayon fabrics. The statement was frequently made when rayon began a few years ago to play an important part in the cotton industry that it might be dyed like cotton in the same machine, with the same colors, etc. It was soon found that this was but partly true, and that to obtain best results much greater care was necessary in the mechanical handling of the goods, and a large amount of research required to show the colors best suited to give uniformity, to dye the cotton and rayon the same shade, to cover up bands due to irregularity in the manufacture of the rayon, and in general to cope with the numerous problems presented when the two fibers are used together. There is to-day probably no phase of textile dyeing being accorded greater study, and although considerable progress has been made in solving these problems, much yet remains before uniform dyeing can be assured.

Merits of the Padder

The machines chiefly used are the padder, jig, and reel dyeing machine. For light and medium shades required on firm constructions, which have been kier boiled and bleached, or otherwise prepared so as to be well bottomed and thoroughly absorbent, the padder gives the lowest cost and greatest production. Depending on the depth of shade and fastness required, the cloth may be batched up on rolls, or run through the padder over a reel and dropped in a box. If the maximum penetration and fastness with any given dyestuff on pad shades is required batching the cloth and allowing the rolls to stand for several hours before drying is necessary. In this case, however, it is a difficult matter for the dyer to judge from his trial batches just how they will compare in shades with the run, and the extent to which the shade will change can only be determined through experience. In either case, the dyed cloth is then taken to the drier, and here again the point to be carefully watched is the tension on the wet cloth. All tension rails and guide rolls on the padder should be smooth and free running to prevent fraying of the cloth.

When faster results are required, either the jig or reel dyeing machine is used. The latter machine is the most useful for all-around work, and there are very few cotton and rayon fabrics which cannot be successfully dyed on it. It has the advantage of low color costs, and permits of almost complete exhaustion of the dyestuff. For crepe constructions, of course, no other machine preserves the effect so well. The silk reel machine enables the dyer to feed the color solution very slowly, and when dyeing is complete, to run the fabric in an exhausted salt solution, which helps materially the covering power of some of the substantive dyes. Time will not permit of a discussion of problems of color application, but it may be stated that the dyeing of uniform shades on cotton and rayon is at times a difficult matter, for the reason that viscose rayon dyes most even at a high temperature, whereas in order to produce a lustrous finish it is desirable to keep the shade of the rayon close to that of the cotton, and this requires a lower dyeing temperature.

The jig is used principally for dyeing goods requiring only a slight preliminary treatment, in most cases only a wetting out, as well as heavy goods woven with a large amount of rayon thrown to the face of the cloth such as satins, twill linings, etc. The latter, if kettle dyed, are apt to show streaks where the cloth is creased while in the rope state. This may also occur on plain weaves of high count. Considerable difference of opinion exists as to the best material to use in the construction of the jig for general cotton and rayon work, although at present the accepted practice seems to be heavy soapstone tanks and Monel metal or brass fittings, which combination permits quick cleaning. However, satisfactory results may be obtained on the ordinary wooden jig if precautions are taken to see that the immersion rolls and beams are smooth and true, and all movable parts free running. The details of temperature, assistants, and all others must be worked out with respect to the class of dyestuffs used. As a general rule, a short bath is preferable to a long one when the cotton and rayon must be dyed the same shade with direct dyes, as this allows a lower temperature to be used and gives quicker exhaustion.

After dyeing, the jig rolls are usually given a light mangling. If available a run on the horizontal extractor is of value in speeding up the subsequent drying, for in this case a large amount of the moisture in the roll has been removed before the cloth passes over the drying cylinders. Some goods may be taken direct to the dryer from the jig without mangling, and this seems to work well if the tension is watched carefully, and the drying cans are not too hot.

The finishing of cotton and rayon piece goods may be considered as falling in two classes: first, the handling of those fabrics which are starched, tentered and calendered on the respective types of machines used for cotton

piece goods, and second, such cloths as require running on silk finishing machinery to obtain best results. In the latter class are such fabrics as chiffons, crepes and satins; in the former, rayon striped broadcloths, voiles and other cloths containing a small amount of rayon. While most of the finishing machines are comparatively simple in construction, the manipulation necessary to produce the maximum luster and width on a given cloth requires constant study.

Sizing Materials

After dyeing and drying, the average cloth of a plain weave with cotton warp is sized on a 2-bowl mangle running in conjunction with a ninety-foot tenter. Starches are seldom used to any extent, due to their opaque nature, with the result that any considerable quantity has the effect of clouding or dulling the luster of the rayon. Transparent gums, such as gum arabic, or gum tragacanth, along with sulphonated oils, give the clearest results and are used in proportions suitable to obtain the proper body and firmness. Specific formulae are of little value inasmuch as the type of bowl used in the mangle pressure applied, and heating facilities at the tenter largely govern the quantity of materials needed.

One of the most common defects met with in rayon filled goods finished through the regular sixty or ninety foot cotton tenter is broken selvedges. In some cases these may be due to faulty cloth construction, but more often are caused by too rapid drying in the tenter. For rayon filled goods of light weight it is desirable to reduce the amount of heat in the first section. If this is supplied by steam coils, reducing valves may be used to advantage. It is likewise a good practice to adjust the sections of the tenter so as to reach the required width gradually.

For the finishing of better grades of rayon fabrics it is necessary to use silk finishing machines, including the quetsch for sizing the goods and the silk tenter and calender for obtaining width and luster. The quetsch works on the same principle as an ordinary starch mangle, except that it is lighter and more easy running. In the case of the three-bowl type, it allows the finisher to apply evenly an exceedingly small amount of size or softener to the fabric. This is accomplished by passing the cloth through the upper nip of the machine.

The finishing solution is carried up in a fine film on the middle bowl, the bottom bowl revolving in a pan containing the solution, and the surplus being squeezed back by the lower nip. The quetsch is sometimes equipped with a series of gas burners, arranged so as to partially dry the cloth before it is sent to the tenter. This arrangement is seldom used on cotton and rayons, however. In using the quetsch, care must be exercised to see that too great a pressure is not exerted on the squeeze rolls, as otherwise the shape of the rayon fiber may be altered from that of a round to a flat thread, and the luster thereby impaired.

After being sized, the cloth is dried and framed to width on the silk tenter. If run on the two-bowl quetsch, and a finished width close to the original gray width is desired, two or more runs on the tenter are necessary. Most silk tenters differ from those used in cotton finishing plants by being equipped with open gas burners at the entering end. There are numerous ideas as to the most efficient manner of regulating this heat, but they all have as their object the rapid drying of the cloth.

Due to the physical properties of the rayon fiber few finishing effects can be produce on the calender, and in this respect it differs materially from cotton. Most cotton and rayon piece goods are given a run through a silk calender as a final finishing operation, its main value being in slightly softening and smoothing out the cloth. Rayon does not permit of friction, schreiner charmeuse or the many combinations of these calenders which turn out the specialty finishes on all-cotton piece goods.

The Palmer machine, in which the face of the cloth is carried against one or more heater cylinders by means of a felt blanket, gives a soft mellow hand with considerable sheen, and may be used to produce a luster not unlike that obtained on all cotton goods by friction calendering. For satin face fabrics it produces the best possible finish. Due to its high initial cost, however, it has not found general use in the cotton and rayon field.

Where the gums or other finishing materials have left the cloth too firm and boardy after drying, one or two runs over a button breaker will soften it down and make the finish more pliable. Care must be exercised regarding the tension, however, or damage to the rayon will result, and it must be borne in mind that the button breaker was originally designed for all-silk goods, which possess much greater elasticity.

At all stages of finishing, dampness must be guarded against, as the well-known property of rayon to stretch under the slightest provocation when damp may result in an unevenly stretched piece of goods, and possibly necessitate refinishing.

Discussion of Handling Cotton-Rayon Goods

President Olney—We have four minutes left for the discussion of this valuable paper.

T. B. Everist—Have you found that the treatment with sodium hypochlorite tends to deaden the luster after a peroxide boil?

Mr. Warner—We have had no experience with peroxide boiling and then subsequently treating with sodium hypochlorite.

Mr. Everist—Have you also found that stearic acid seems to deaden the luster of the rayon in finishing?

Mr. Warner—That is a point to which we are giving some study at the present time. So little is known about these finishing materials that are being used that we are doing considerable research to try to find out the answers to many of those problems which we are not at the present time sure of. If anyone has had any experience along those lines I personally would be glad to hear about it.

President Olney—Are there any further questions or remarks?

The next paper is "Detergents for Wool—Relation of pH to Detergent Efficiency," by Prof. Chas. E. Mullin, of Clemson College, South Carolina.

[NOTE.—*The proceedings of the Saturday morning Technical Session of the Annual Meeting will be concluded in the January 9th issue. The report of the Saturday afternoon session will appear also, in full or in part, in the next issue. The proceedings of the Seventh Annual Banquet were published in the issue of December* 12.]

DECEMBER MEETING OF THE RHODE ISLAND SECTION

The December meeting of the Rhode Island Section of the American Association of Textile Chemists and Colorists was held on Monday evening, December 5, at the Jesse Metcalf Chemical Laboratory, Brown University.

Mr. Hutton, Chairman, presided.

Mr. Harry Price, of the Celanese Corporation of America, the speaker of the evening, delivered an interesting address on the subject, "The Handling of Celanese." Most attractive samples were displayed.

That the subject was of special interest was shown by the unusually good attendance, there being over 110 members and guests present.

ALBRO N. DANA, *Secretary.*

FORTY-FIRST RESEARCH COMMITTEE MEETING

The Forty-first Research Committee Meeting of the American Association of Textile Chemists and Colorists was held at the Engineer's Club, Boston, Mass., on November 4, 1927. The following members were in attendance: L. A. Olney, W. M. Scott, W. S. Williams, A. E. Hirst, H. Christison, Walter C. Durfee, W. H. Cady, P. F. Ripley, W. E. Hadley. Letters of regret at being unable to attend were received from R. F. Culver, W. R. Moorhouse and P. J. Wood.

W. H. Cady spoke with some detail in regard to the work which the Committee on Fastness to Light has been conducting, and stated that a more complete report of its activities would be presented at the Annual Meeting.

Mr. Cady and Mr. Christison were designated to see if it would be possible to make a tabulation of the data presented in the report on Light Fastness in order that it might be more easily understood.

Discussion of the future work of the Research Committee was considered. It was believed that the Committee might undertake to advantage the standardization of the methods of analyzing and testing the different chemicals used by the textile industry.

A letter received from the British Committee on Light Fastness was read, and attention drawn to the fact that our Research Committee is now collaborating with French, German and English representatives in the matter of Light Fastness.

W. E. HADLEY, *Secretary.*

FORTY-SECOND RESEARCH COMMITTEE MEETING

The Forty-second Meeting of the Research Committee was held at the Pennsylvania Hotel, New York, on Friday, December 2, 1927. The following members attended: L. A. Olney, W. S. Williams, W. M. Scott, Walter C. Durfee, E. H. Killheffer, G. A. Moran, H. Christison, R. F Culver, W R. Moorhouse, S. L. Hayes, L. W. Leitch, R. W. Hook, Karl Moore, W. C. Smith, R. E. Rose, W. H. Cady, Ben Verity, P. F. Ripley, P. J. Wood, W. E. Hadley.

The question of publishing a special list of American made dyes having no Schultz & Julius or Colour Index numbers in the 1928 Year Book was discussed, and it was decided to proceed with the gathering of the data for such a list designating the various dyes as being the same or "similar to" certain foreign pre-war prototypes.

Attention was drawn to the fact that certain dyestuffs in the list as published in the 1927 Year Book had been erroneously marked with daggers. These errors have been corrected by a notice in the Proceedings, and a printed slip will shortly be sent to the holders of the Year Book, as a correction slip for insertion in the proper place.

A letter received from M. Wahl, of France, in which he offered his services in the matter of establishing international color standards, was read by the chairman.

The program of the Research Committee and subcommittees for the coming year was discussed with some detail.

It was the consensus that the tentative fastness methods should be thoroughly revised in line with the criticisms and suggestions which have been received from time to time, in order that they may be as complete as possible in the 1928 Year Book.

It was the opinion of the Committee that washing tests, at any temperature under a boil, could be best controlled in some type of special washing machine. Two mechanical washing devices are now being used by different members of the Research Committee. Both pieces of apparatus use fruit jars rotating about a central axis, one

being heated with hot air and the other with hot water. Both of these machines keep the samples in constant motion. Comparative results have been very readily obtained with these two devices.

Mr. Cady reported that he would present a further report of the Light Fastness Committee at the January meeting.

The possibility of having more sub-committee meetings of the Research Committee in the future was discussed but no definite action taken.

Wm. C. Smith, Research Associate for the Association, at present working under the direction of the Bureau of Standards, was present at the meeting.

W. E. HADLEY, *Secretary.*

FORTY-EIGHTH COUNCIL MEETING

The Forty-eighth Council Meeting of the American Association of Textile Chemists and Colorists was held at the Engineers' Club, Boston, Mass., on Friday, November 4, 1927. The following members were in attendance: Prof. L. A. Olney, W. M. Scott, W. S. Williams, A. E. Hirst, H. Christison, Walter C. Durfee and W. E. Hadley. Letters of regret at being unable to attend were received from R. F. Culver and W. R. Moorhouse.

The following applicants were admitted to membership:

Active Members

Fisher, Nelson A., overseer of dyeing, Louisville Woolen Mills. Address: 867 South Third Street, Louisville, Ky.

Harkins, Arthur T., colorist, Newport Chemical Works, Inc. Address: 240 Main Avenue, Passaic, N. J.

Jacoby, Areli H., treasurer, The Deltex Company, 516 Atlantic Avenue, Boston, Mass. Address: 516 Atlantic Avenue, Boston, Mass.

Kritchevosky, Dr. Wolf, chemical director. Address: 1401 West Jackson Boulevard, Chicago, Ill.

Pharr, Wm. N., superintendent, Hartsell Mills Company. Address: P. O. Box 203, Concord, N. C.

Prisley, Frederic A., chemist, Wanskuck Mills. Address: 135 Ohio Avenue, Providence, R. I.

Sims, Walter, textile engineer, Greenville Finishing Company, Greenville, R. I. Address: 934 Smithfield Avenue, Saylesville, R. I.

Suttenfield, T. W., superintendent, Cloverdale Dye Works. Address: 914 South Main Street, High Point, N. C.

Junior Members

Bouchard, George H., chemist and dyer, Hayward Hosiery Company. Address: Ipswich, Mass.

Tickle, Herbert M., dyer and bleacher, American Thread Company. Address: 217 Doyle Street, Fall River, Mass.

Corporate Member

Mount Hope Finishing Company, North Dighton, Mass. Representative: Jos. K. Milliken, treasurer.

The greater part of the Council Meeting was taken up in a discussion of the Annual Meeting, including the completion of the program for the Open Forum on Friday evening, and the general meeting on Saturday.

The proposed Amendments to the Constitution, signed by ten members, were considered in detail and adopted by the Council for presentation at the Annual Meeting.

With reference to the five years' experience required of applicants for Active Membership, it is the sense of the Council that credit for not exceeding one year may properly be given to a graduate of an accredited textile school who has completed a full course of four years, and to graduates of other educational institutions at the discretion of the Council.

The matter of appointing a finance committee was deferred until after the Annual Meeting.

Dr. Hans Meyer, of the General Dyestuff Corporation, New York, was elected a member of the Research Committee.

It was suggested that the 1928 Year Book should contain a list of American dyes which have no Schultz & Julius or Colour Index numbers, but which have a prewar prototype.

It was voted that Mr. Smith, our Research Associate, should attend the Annual Meeting.

A list containing ninety-eight members whose dues are in arrears for 1927 was handed the Council by the Treasurer, and it was voted that these names should be dropped.

W. E. HADLEY, *Secretary.*

FORTY-NINTH COUNCIL MEETING

The Forty-ninth Council Meeting of the American Association of Textile Chemists and Colorists was held at the Pennsylvania Hotel, New York, on Friday, December 2, 1927.

The following members were in attendance: L. A. Olney, W. S. Williams, W. M. Scott, Walter C. Durfee, E. H. Killheffer, G. A. Moran, H. Christison, R. F. Culver, W. R. Moorhouse, S. L. Hayes, L. W. Leitch, W. E. Hadley.

The following members were admitted to membership:

Active Members

Aibel, David, dyer and manager, 309 Johnson Street, Brooklyn, N. Y. Address: 2148 Sixty-first Street, Brooklyn, N. Y.

Broadfoot, John F., dyer, Providence Dyeing, Bleaching and Chemical Company. Address: 60 Gentian Street, Providence, R. I.

Chalon, O. T., paper expert, General Dyestuff Corporation. Address: 265 Riverside Drive, New York City.

Epstein, Herman, dyer, National Rayon Dyeing Company. Address: 872 South Sixteenth Street, Newark, N. J.

Geber, Israel, dyer. Address: Advance Piece Dye Works, 2157 Prospect Avenue, Bronx, N. Y.

Ward, Richard W., dyer, Providence Dyeing, Bleaching and Chemical Company, Providence, R. I. Address: Box 518, East Greenwich, R. I.

Whelchel, Homer, chemist, Central Franklin Process Company. Address: Cleveland Road, Chattanooga, Tenn.

Junior Member

Webb, R. H., dyer, Hartsell Mills. Address: Bell Avenue, Concord, N. C.

Corporate Membership

John Campbell & Co., 75 Hudson Street, New York, N. Y. Representative: George C. Lommel.

Takamine Laboratory, Inc., Clifton, N. J. Representative: Eben I. Takamine.

The Felters Company, Inc., Millburn, Mass. Representative: J. Brandon Manning.

Passaic Print Works, Passaic, N. J. Representative: P. F. Kingsbury.

United Piece Dye Works, Zodi, N. J. Representative: Norman Peterkin.

The list of members who were dropped for non-payment of dues was reconsidered, and it was voted that a Membership Committee, consisting of the Treasurer as Chairman, and the Chairmen of the Local Sections should look into the matter of those members who were delinquent in the payment of dues.

The Committee on Award of Prizes for the best papers published during the past year made the following recommendations:

$100—The Enzymes, by Dr. R. E. Lee, Director Department of Applied Research, The Fleischmann Company.

$75—Modern Theories of Dyeing, by Dr. R. E. Rose, E. I. du Pont de Nemours, Wilmington, Del.

$50—The Chemical Constitution and Fastness Properties of Colors, by Dr. B. Wuth, Ciba Company, New York.

$25—Manufacture and Use of Hydrosulphite Compounds, by C. S. Hollander, Rohm & Haas.

P. J. Wood was appointed Chairman of the Finance Committee.

The President appointed Carl Moore and Walter C. Durfee to act as tellers at the Annual Meeting.

W. E. Hadley, *Secretary*.

Applicants for Membership

Active Membership

Adler, John, dye house owner. Sponsors: Jos. Colman and A. J. Winkler.

Carr, Kenneth L., textile chemist, bleaching station, Roessler & Hasslacher Chemical Company, Perth Amboy, N. J. Sponsors: T. D. Ainsle and W. E. Hadley.

Doux, Eugene M., dyer, the Schwarzenbach-Huber Company, Union City, N. J. Sponsors: E. L. Maupai and P. H. Stott.

Earle, Richard B., manager, softeners, soaps, etc., U. S. Finishing Company, Providence, R. I. Sponsors: Wm. Witte and T. Turner.

Ebersold, Ebersold, dyer, James Lees & Sons Company, Bridgeport, Pa. Sponsors: E. C. Bertolet and P. Theel.

Franklin, Roger G., salesman, Dyestuff Department, E. I. du Pont de Nemours & Co., Philadelphia, Pa. Sponsors: R. A. Carter and W. S. Hamlen, Jr.

Krug, Karl, demonstrator salesman, E. I. du Pont de Nemours & Co., Philadelphia, Pa. Sponsors: R. A. Carter and W. S. Hamlen, Jr.

Moertel, John C., textile chemist and colorist, Newport Chemical Works, Inc., Passaic, N. J. Sponsors: E. A. Keeler and P. H. Stott.

Morris, Frank J., colorist, American Aniline Products, Inc., New York City, N. Y. Sponsors: G. L. Armour and A. F. Musgrave.

Junior Membership

Donnar, James Robert, chemist, American Printing Company, Fall River, Mass. Sponsors: A. D. Nute and Ben Verity.

Gaede, A. Henry, dyer, Caledonian Dye Works, Philadelphia, Pa. Sponsors: P. Theel and E. C. Bertolet.

Lipsius, Jr., Edward, laboratory assistant, E. I. du Pont de Nemours & Co., Penns Grove, N. J. Sponsors: R. A. Carter and W. S. Hamlen, Jr.

Spengler, Carl J., student, Philadelphia Textile School, Philadelphia, Pa. Sponsors: P. Theel and E. C. Bertolet.

AMERICAN
DYESTUFF REPORTER

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

LOUIS A. OLNEY
PROFESSOR OF CHEMISTRY AND DYEING, LOWELL TEXTILE SCHOOL
Directing Editor

CLAYTON HOAGLAND
Managing Editor

MYRON DREW REESER
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DROPPING THE DIGNITY FROM RESEARCH

PRODUCTS as unlike each other as automobiles and toothpaste and breakfast food are being sold to-day by means of testimonials from satisfied users. The testimonial form of advertising has yet to be applied on a large scale to technical research for industry. It is a fact that industry is coming more to look on research as a cold business proposition, which means that those who are advocating research for this or that particular industry must, eventually, use modern selling methods to put across their idea.

Let us grant that technical research as we understand it possesses a certain dignity which seems to repel any attempt to hawk it about in the common marts of trade. But devotees who would preserve that dignity by speaking of research in the most awed and reverent tones place themselves in a class with the monks of yore, who secured a monopoly on all knowledge available at that time, and then hoarded it in cloistered libraries, safely beyond reach of the masses.

It is understood that about research there has grown up in the past few years a prestige that should be perpetuated, for upon the crest of that prestige research is riding forward to new triumphs in industry. As much as this prestige forms of the dignity surrounding research we would preserve. But nothing should be allowed to keep research from "the masses," in this case represented by industry in general. Strengthen the prestige of research but spread abroad the news of its *achievements* until that news becomes common knowledge.

We rather like the attitude of Charles Belknap, vice-president of the Merrimac Chemical Company, who, in the course of a talk before the Advertising Club of Boston recently, freely admitted that much of the increased revenue which has come to his company has not gone into its treasury, and summed up his theme in these words:

> Where would we be if we hadn't spent it for research? Any company which does not adopt a policy of research in its business may as well set the date of its liquidation. I believe that in research is the answer to a competition that is increasing every day. We find that it is our best weapon, both for defense and offense.

A more convincing testimonial would be hard to find. The speaker might have added, however, that many companies have learned by experience that the most economical and at once the most profitable way to pursue research is to help finance groups organized for research which represent an entire branch of an industry; groups that are working for the good of the industry, and that produce, through their studies, results of benefit to all. This is one method of wielding a "weapon for defense" against the real competition—the competition of a revitalized Europe that we must meet in the markets of world trade.

THE CLOSING YEAR

AS 1927 nears the end of its course, business reviews of the last quarter continue to reflect the same optimism that has characterized the entire business year. Some of this optimism will be carried into the new year and will color many of those pretentious forecasts which are invariably published in the press of the country about January 1. Whether it will be justified during the coming twelve months is a question now unanswerable.

Much of the business optimism, however, has come from seats of authority. Meeting last month in Texas, for their annual convention, members of the American Bankers Association were unhesitant in pointing out the *soundness* of our prosperity. In fact, the bankers seemed quite satisfied with general conditions. Agriculture has immeasurably improved its position; labor, aside from one or two isolated cases of unrest, has been more contented than at any time in its history; and while fall business activity may not have been entirely up to expectations it receded slowly and orderly with no tendency whatever toward the old-fashioned "slump."

Coming closer to home, conditions in textiles are not such as to cause more than a healthy discontent. According to a current review made by the National City Bank, the cotton spinning industry is so far maintaining the usual activity which had its inception in last year's cheap cotton. Sales recently have not been keeping pace with production; decline in cotton prices has caused a decline in business. Generally sound conditions of the market up to this time, however, gives confidence that needed readjustments can be made without serious disturbance.

In other textile lines, according to this bank's report, woolen mill activity is showing a fair increase over that of a year ago, and some mills are doing a good volume of business, but generally speaking, the present position and near-term outlook is still unsatisfactory. The silk

industry continues very busy, deliveries of raw silk to mills in September and for the first nine months of the year being the largest on record. Profits, however, have not shown corresponding improvement owing to excessive competition and weakness in raw silk prices. The boom in rayon is unabated, however, and leading companies have announced output sold up to February 1. Some producers have exceeded last year's record.

INDUSTRIAL HEALTH AND THE LOCAL HEALTH AGENCY

HEALTH work for the benefit of employees of large mills, industrial plants and offices is now as much a part of routine management as the inspection of machinery. An extensive medical service for examination, treatment and follow up is provided, and the medical directors as well as owners agree that the expenditure is, on the whole, a well-paying investment. The owners of many smaller mills, however, are still unable to establish a satisfactory health service for their employees because physician, nurses, hospital beds and clinic equipment are too costly. On the other hand the workers are more apt to remain in employment where a health service is assured.

To such establishments the increasing attention given to industrial health by volunteer *health agencies*, notably the tuberculosis associations, is a boon. One of the main planks in the anti-tuberculosis platform is to prevent physical breakdown and to discover early, curable cases. As it is during the most productive years that the disease most frequently occurs, working men and women become of vital importance in the battle to eradicate the white plague. Moreover, the preventive measures employed in this work check up the condition of the entire body and help to build up resistance against other illnesses.

These health agencies which are active in all parts of the country are prepared to show the way and to cooperate with employers. For an industrial health program, some of them provide physicians for the examinations of employees without cost, on a voluntary and confidential basis. Recommendations for treatment are made, and are followed up to make sure they are carried out.

For the benefit of small plants one health association has, for example, organized local factories into units for *co-operative* medical service. Each unit is composed of mills employing from twenty-five to five hundred workers, a total of one thousand workers per unit. For this group, one full-time nurse and a part time physician are engaged. Each plant in the unit provides a first aid or clinic room in its own establishment and pays a quarterly pro rata share of the maintenance of the unit, based on the number of employees. During 1926, $4.50 per employee per year was determined upon as a preliminary cost figure.

Regular visits are made every week to each plant by the physician and the nurse, whose time in each place is determined by the number of employees. No less than three hours of health work each week per one hundred employees is provided. Complete records of all the work that is done are kept by the nurse at the plant.

The Federal Reserve Bank of New York has an interesting system for caring for the health of its employees. It conducts an extensive medical service in co-operation with a number of agencies that specialize in certain diseases. One of the most effective of these relationships is with the New York Tuberculosis and Health Association, to which all post pneumonia, influenza, pleurisy, empyema or bronchitis cases are sent for a check-up by a tuberculosis specialist. This scheme alone, it is believed, has resulted in a marked decrease in active tuberculosis cases among the bank's employees. On the advice of the physician, workers are frequently sent away for short rest cures, and the bank authorities have learned that a two or three weeks' leave of absence may save a considerably longer absence later on. Because of the high standing of the tuberculosis organization, the patients have complete confidence in the opinion of its specialist.

The Louisville Tuberculosis Association of Louisville, Ky., has worked out a simple plan for gaining the worker's confidence. A letter is sent to his home address offering a free medical examination. With it is enclosed a blank form to be filled out and returned to the organization if the examination is desired.

Employers who are bothered with absenteeism and labor turnover are likely to find an efficacious and economical remedy through co-operation in the industrial health programs of their local tuberculosis or public health association. This special phase of the anti-tuberculosis campaign is steadily increasing along lines satisfying not only to the worker but to the business man. A large part of the funds realized through the annual sale of the Christmas seals is used for this purpose.

BIBLIOGRAPHY OF COLORIMETRY

A Communication

In connection with the work of the Colorimetry Section of the Bureau of Standards and the report of the Colorimetry Committee of the Optical Society of America, I am desirous of compiling a bibliography of papers and books having direct bearing on colorimetry, spectrophotometry, and color specifications. It is expected that this bibliography will ultimately be published in the Journal of the Optical Society. It will also be of use in replying to frequent inquiries for information on this subject. In the interest of completeness and accuracy, all authors who have contributed to this subject are requested to send me check lists of their papers giving titles and complete journal references.

The following subjects are mentioned as illustrative of the classes of material desired:

1. Color of daylight and artificial sources. (Spectral distribution of energy, color temperature.)

2. Visual psychophysical data. (E. g., visibility of energy, hue discrimination, saturation discrimination, brilliance discrimination, excitations, abnormal color sense.)
3. Theories of color vision.
4. Methods of computing the trilinear co-ordinates, dominant wave length, and purity from data on spectral distribution.
5. Spectrophotometric instruments and methods.
6. Spectral transmission of materials.
7. Reflectance of materials.
8. Colorimeters.
9. Systems of color standards.
10. Applications of colorimetry and photometry to chemical analysis.
11. Turbidity and scattering of light.
12. Color nomenclature and terminology.

Reprints will also be of real service and will be gratefully received. I already have a considerable collection of such reprints. They are classified by subjects, and are of great assistance to those engaged in colorimetric research at the Bureau of Standards. This collection has been profitably used not only by regular members of the staff but by temporary research associates and visitors at the Bureau. It is desired to keep it up to date and make it as complete as possible. Authors who have reprints available can very effectively assist in the dissemination of information by contributing copies to this collection since by consulting it workers on a given subject can find together in one place the pertinent literature, the discovery of which would otherwise require diligent and laborious search through many scattered journals on physics, chemistry, psychology, physiology, and sundry kinds of technology.

IRWIN G. PRIEST,
Bureau of Standards, Washington, D. C.

COMMISSION THROWSTERS MEET

The annual meeting of the Commission Throwsters' Division of the Silk Association of America, Inc., was held recently at the National Republican Club, 50 West Fortieth Street, New York City.

The business session, which was preceded by a luncheon, was presided over by Charles M. Epstein. Large delegations were present from the Lehigh Valley, Wilkes-Barre, Scranton and Paterson sections of the division.

Announcement was made that the Cost Accounting Manual for Throwsters which has been in the process of compilation for some time will be off the press about the end of this month. H. S. Park is chairman of the cost accounting committee.

In order to increase the attendance at the monthly meetings of the Executive Committee, which are held in New York City, it was voted that each regional section of the division elect a vice-chairman and committee man at large who will be ex-officio members of the Executive Committee and who will be expected to attend the monthly meetings.

RECENT LITERATURE

Safety in Spray Coating

Final Report of the Committee on Spray Coating. Chemical Section, National Safety Council. Chicago. 53 pages.

All forms of spray coating were exhaustively studied by a special committee of the Safety Council composed of representatives ably qualified to report on the subjects. Their findings are given in detail in this monograph. Spray coating is examined from the viewpoint of its dangers. The report comprises sections on the historical development of spray coating, spray painting, benzol poisoning as a hazard, lead poisoning and silicosis as spray coating hazards, protection of workers, fire hazards, etc.

ON WASHROOM PRACTICE

Textile men are beginning to recognize the important functions assumed by the modern laundry in perpetuating the life of textile fabrics and garments. A new book has been issued which should be of considerable interest to all concerned with the processing of textiles. It is entitled "The Washroom" and its contents was compiled as the result of several years' research by the technical staff of Procter & Gamble. Consisting of 126 pages, illustrated, it deals with the most modern methods of laundering textiles and improving washroom practice. Its publication was coincident with the announcement that the laundry industry is preparing to launch a gigantic advertising campaign.

SILK DINNER PLANS ANNOUNCED

The Silk Association of America plans to make its fifty-sixth annual dinner livelier and more interesting than last year's affair. Invitations to the dinner, which will be held at the Hotel Astor on January 19, have been sent to members of the association and many reservations have been made.

The number of dinner guests will be limited this year, the association announces, because of the increase in the size of the dinner during the past few years.

Outstanding speakers will address the gathering, and Paul Whiteman's Piccadilly Players will furnish the music. Attractive souvenirs, new song parodies and an exceptional menu will be features.

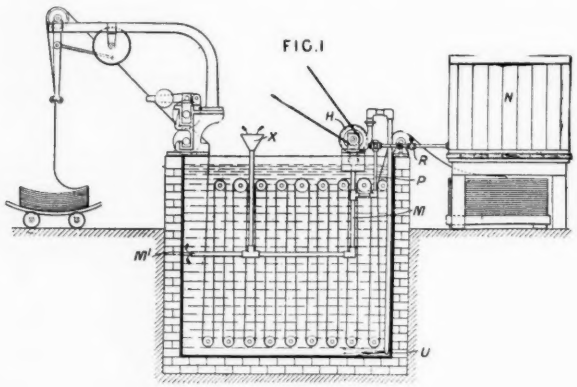
J. L. Wiley has joined the staff of Arthur D. Little, Inc., chemists and engineers of Cambridge, Mass. Mr. Wiley was formerly librarian and translator for the Solvay Process Company, and will do similar work in his new connection.

Technical Notes from Foreign Sources

Dyeing Apparatus

The dyeing apparatus shown in the accompanying illustration, and patented in British Patent No. 273,-207, is characterized by special features relating to the supplying and distributing of the fresh liquors and the addition of regulated quantities of reagents to the treating liquors, as well as circulation of the fluids.

Means are thus provided for separately or simultaneously adding fresh dye liquor or extra reagents in a zig-zag roller machine, in which the liquid is circulated by means of a pump H which has an intake M^1 at the delivery end of the vat and a spray discharge U which consists of a horizontal peerforated pipe at the bottom of the other end of the vat. Concentrated dye solution may be admitted by a valve R and pipe P from an elevated tank N to the immersed pipe M on the intake side of the pump, and extra reagents may be a lded through a funnel X, also on the pipe M.



Dyeing Mixtures of Wool and Viscose

In order to obtain white effects on the viscose portion of the fabric, all-acid colors, which leave cotton white, are employed for the purpose of dyeing the wool portion of the fabric. The dyeing of these mixed fabrics is very simple, in that the wool is dyed with the aforementioned dyestuffs, and then after the fabric has been washed the viscose portion may be dyed in any desirable shade. The process is carried out in a dye liquor which contains soda and Glauber salt, for these chemicals have a very favorable effect in increasing the absorption of the suitable substantive colors by the fibers. In order to prevent the wool fibers from absorbing these dyestuffs, 3 per cent of Katanol W is added.

In producing single shades on both the wool and the viscose portions of the fabric, either the two-bath or single-bath process may be used. In order to obtain a dark shade with the aid of the two-bath process, the dyeing liquor must be kept at a higher temperature in dyeing the viscose silk, simply for the reason that the color is incompletely absorbed by the fibers at lower temperatures or in the cold. Hence the process is carried out at a temperature of 50 to 60 deg. Cent., and again 3 per cent of Katanol W is added to protect the wool.

In the single-bath process, care must be taken to see that the viscose portion of the fabric is not dyed more deeply than the wool portion at the dyeing temperature of 50 to 60 deg. Cent. The temperature of the dye liquor is accordingly gradually increased. If the woolen portion of the fabric is dyed more deeply than the rayon portion, then less substantive dyestuffs are added and the cloth is shaded off with wool dyestuffs that can be used in a neutral bath and which do not affect the rayon. Dyeing with the addition of potassium chromate is also particularly advantageous when a mixture of artificial wool and rayon is being dyed. The dyeing process is then carried out with the addition of 20 to 30 per cent of Glauber salt and the usual substantive dyestuffs are employed in the place of the chrome-sensitive wool colors. Furthermore, the addition of 1 to 2 per cent of acetic acid at the beginning of the dyeing process, or, better, after the dyeing has lasted for thirty minutes, is advantageous. (Deutsche Faerber Zeitung, 1927, page 882.)

Notes on the Indigosols

The whole range of vat dyestuffs can be produced in water-soluble form on the same lines as Indigosol O. It is thus possible to dye woolen materials in an acid bath with these colors, and then reproduce the insoluble vat dyestuffs on the fiber by oxidation. Various Indigosols are on the market and some of these are described.

Special attention is paid to the classification of the Indigosol dyestuffs in dyeing wool. It is known that the original vat dyestuffs require varied methods of application in order to obtain the best results, and in some measure these same differences are to be observed in dyeing with Indigosols. Thus Indigosol O should be developed at a temperature of 25 to 30 deg. Cent., Indigosol OR at a temperature of 55 deg. Cent. and Indigosol O4B at a temperature of 85 deg. Cent. The various Indigosols may be grouped in accordance with the temperature at which they are best developed.

Three groups are developed along these lines, namely: Indigosols, which are dyed acid and developed in the cold at 25 to 30 deg. Cent.; Indigosols

which are dyed acid and developed at a temperature of 50 to 55 deg. Cent.; Indigosols which are dyed acid and developed hot at a temperature of 90 deg. Cent.

Attention is called as well to the use of Indigosols on silks and cottons. In the case of silk, the method of application is very similar to that of wool. The colors are dyed in an acid bath by working one hour at a temperature of 80 deg. Cent. The development is carried out with dichromate and sulphuric acid, and the temperature of the developing bath must in all cases be raised to about 80 deg. Cent. The shades obtained are of excellent fastness to light and boiling off.

Indigosols have no direct affinity for vegetable matter, and it naturally follows that the application of these dyestuffs on cotton cannot be termed an ordinary dyeing process. The method employed is to impregnate the cotton by padding or on the jigger, hydroextracting or squeezing without washing, and then developing the color on the fiber in a separate bath. (Journal of the Society of Dyers and Colorists, 1927, pages 251-253.)

Spraying Textiles

Yarns and other textile materials are moistened with measured quantities of water which are taken from vessels free from pressure and sprayed by compressed air. In the construction, as shown in Fig. 1, two measuring cylinders a^1 and a^2 are, on rotation of a four-way cock i, alternately filled by a tube o from a constant level reservoir l, and emptied by a pipe m to a nozzle s, which is supplied with compressed air by a tube n. The quantities of water delivered are adjustable by raising the cylinders a^1 and a^2 by a screw g over a scale f. In the construction shown in Fig. 2, one measuring cylinder a is, on rotation of a three-way cock i, alternately filled from a reservoir l or supply line, and emptied by the pipe m to the nozzle. The quantity delivered is adjusted by adjusting a displacer t in the cylinder a by a screw g. (British Patent No. 273,285.)

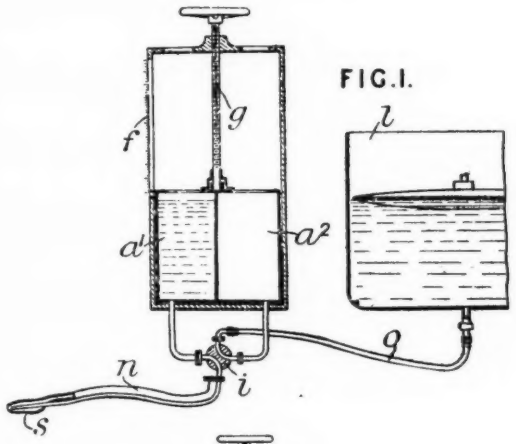


FIG. 1.

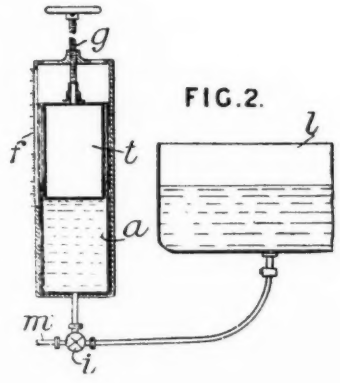


FIG. 2.

Investigations in Dyeing with the Indanthrenes

Various curves are given to show the mechanism of the exhaustion process in the usual color bath, the percentage of hydrosulphite in the liquor (per liter) being plotted against the time. Six such curves were determined for various Indanthrene dyestuffs. In each curve diagram the total reducing value of the liquor as well as the hydrosulphite excess are shown. In the case of Indanthrene Orange RRTS, tests were made to determine the absorption of the dyestuff from differently concentrated vat liquors, and it was found, as expected, that the absorption of the dyestuff was much more rapid in the more concentrated liquor. It was therefore concluded that it is best to add small portions of the dyestuff to the liquor in order to obtain level shades.

Tests were also made to vary the proportion of alkali (sodium hydroxide) in the liquor. Thus in place of the usual 12 c.c. of lye per liter, dyeings were carried out with 6 c.c. and 48 c.c. of sodium hydroxide solution, 40 deg. Be. It was found that the exhaustion of the bath was slowest at the standard alkalinity (12 c.c.), while the speed of exhaustion is much increased at 48 c.c. and catastrophically increased at an alkalinity of 6 c.c.

The effect of variation in the concentration of hydrosulphite was also determined, and vat liquors containing 2, 4 and 16 grams per liter were used. In this instance the influence of the oxidation on the decrease if the excess hydrosulphite preponderates in such a manner that the analytical figures give no indication of the real effect.

It was determined that the oxidation of the hydrosulphite depends on quite a number of conditions. Thus, as far as the concentration of the hydrosulphite solution is concerned, one hour's standing of the solution in the ordinary porcelain beaker at a temperature of 55 deg. Cent. showed a loss of 25 per cent in the 12 gram liquor, 15.4 per cent in the 5-gram liquor and 39 per cent in the 0.5 gram liquor. The effect of temperature was also determined.

Twelve grams of hydrosulphite at 50 deg. Cent. Decrease of 25 per cent.

Twelve grams of hydrosulphite at 20 deg. Cent. Decrease of 11.7 per cent.

Five grams of hydrosulphite at 55 deg. Cent. Decrease of 15.4 per cent.

Five grams of hydrosulphite at 20 deg. Cent. Decrease of 11.7 per cent.

For further details the reader is referred to the original article in Melliand's Textilberichte, 1927, pages 785-787.

NATIONAL PRODUCES THREE VAT DYES

The research laboratories of the National Aniline & Chemical Company have successfully worked out the production of three new vat colors, which have been placed on the market under the brand names of National Carbanthrene Blue GCD Double Paste, National Carbanthrene Yellow G Double Paste and National Carbanthrene Black B Double Paste. They are described in the announcement as readily reduced and dissolved with caustic soda and hydrosulphite and as suitable for application on rayon and cotton in all types of machines.

Carbanthrene Blue GCD Double Paste, it is claimed, produces pure shades of blue of exceptional fastness to sunlight, washing, organic acids, perspiration and cross-dyeing. It is recommended for use wherever these fastness properties are required, such as in shirtings, dress fabrics, yarns, etc. Described as adaptable for both direct and colored discharge printing, it is said to be of value to the printing trades. Is also has extensive use in the dyeing of silk.

Pure yellow shades of remarkable fastness on vegetable fibers and rayon, it is claimed, can be produced with the new National Carbanthrene Yellow G Double Paste. Because of its fastness to washing and chlorine, it is said to be valuable in dyeing yarns to be used in wash fabrics that will be bleached in the piece.

The new Carbanthrene Black B Double Paste produces a dull green on cotton, linen and rayon from the usual caustic-hydrosulphite vat, which on aftertreatment with chlorine changes to a gray to black, described as of exceptional fastness to light, washing, organic acids, chlorine alkali and cross-dyeing. When dyed on silk and diazotized with nitrous acid it produces grays or blacks also claimed to be of excellent fastness to light and washing.

A DU PONT SCARLET FOR PRINTING

The Dyestuffs Department of E. I. du Pont de Nemours & Co. announces their new red for calico printing, Du Pont Naphthanil Scarlet for Printing, which is similar in its working properties to Du Pont Naphthanil Red for Printing. The shade of the new brand is yellower and brighter.

The use of the new product allows a production of reds and pinks described as having extremely good fastness to light, washing, crocking and chlorine; shades that compare favorably in fastness with those produced with vat reds.

However, the application, according to the announcement, is far simpler in using this new product than by preparing the goods with various naphthols and subsequently printing with a diazotized base, as several of the manufacturing steps are eliminated.

Owing to the demand for liquid chlorine for use in bleaching sulphite pulp, the Canadian Salt Company, Ltd., has made extensive additions to its chemical plant. It has also moved its salt plant from Windsor to Sandwich, Ont., thus bringing the two plants close together and reducing production costs.

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i. e., help wanted, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.

SALESMAN

To sell throwing oils to silk mills. Must be acquainted in the trade. Splendid opportunity for the right man. Address Box 433, American Dyestuff Reporter.

COLORISTS

WANTED—Large color house in New York requires several colorists. Moderate salary to start. Address Box 434, American Dyestuff Reporter.

SALESMAN

Salesman wanted to represent in the Middle West American dyestuff manufacturer of full line of aniline colors. About thirty years of age. One having experience preferred. State qualifications and when available. Address Box 435, American Dyestuff Reporter.

TEXTILE CHEMIST

A vacancy exists in our Experimental Dyehouse, for the dyeing of Celanese, for a young chemist. Applicants should have good training in dyeing and finishing, etc., though previous experience is unnecessary. Replies, giving full details of training and experience and stating age and salary required should be sent with a small photograph to Celanese Corporation of America, Cumberland, Maryland.

PLANT RESEARCH CHEMIST

Plant research engineer or chemist. A progressive New England mill is seeking an experienced man, preferably a graduate chemist or engineer capable of making his own position as investigator and developer of new processes and treatments. Should be familiar with practical plant operations and capable of constructing and operating experimental equipment. Executive talent is not required. Give full details in first letter. Replies will be acknowledged to applicants who appear to be qualified. Address Box 436, American Dyestuff Reporter.